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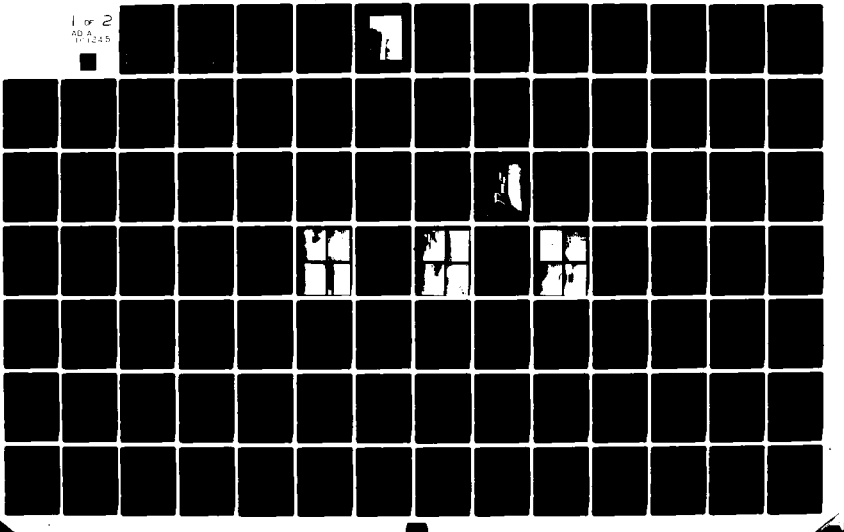


DELAWARE RIVER BASIN
BRANCH OF HORNBECKS CREEK, PIKE COUNTY

PENNSYLVANIA

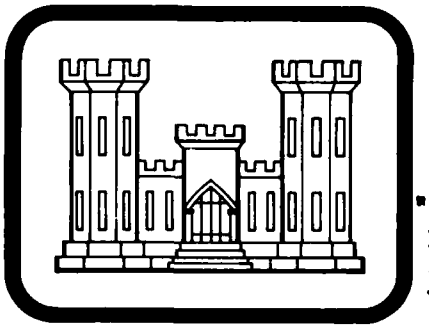
LEVEL II

FAWN LAKE DAM

(NDI I.D. NO. PA-00822
PENNDER I.D. NO. 52-182)

MARCON, INC.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



"Original contains color plates: All DTIC reproductions will be in black and white"

PREPARED FOR

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

DACW31-81-C-0014

PREPARED BY

GAI CONSULTANTS, INC.
570 BEATTY ROAD
MONROEVILLE, PENNSYLVANIA 15146

JUNE 1981

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the Spillway Design Flood is based on the estimated Probable Maximum Flood (greatest reasonably possible storm runoff) for the region, or fractions thereof. The Spillway Design Flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

Breach analyses are performed, when necessary, to provide data to assess the potential for downstream damage and possible loss of life. The results are based on specific theoretical scenarios peculiar to the analysis of a particular dam and are not applicable to other related studies such as those conducted under the Federal Flood Insurance Program.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ABSTRACT

Fawn Lake Dam: NDI I.D. No. PA-00822

Owner:	Marcon, Inc.
State Located:	Pennsylvania (PennDER I.D. No. 52-182)
County Located:	Pike
Stream:	Branch of Hornbecks Creek
Inspection Date:	15 October 1980
Inspection Team:	GAI Consultants, Inc. 570 Beatty Road Monroeville, Pennsylvania 15146

Based on a visual inspection, operational history, and hydrologic and hydraulic analysis, the dam is considered to be in fair condition.

The size classification of the facility is small and its hazard classification is considered to be high. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) for the facility ranges between the 1/2 PMF (Probable Maximum Flood) and the PMF. Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 1/2 PMF. Results of the hydrologic and hydraulic analysis indicate the facility will pass and/or store only about 15 percent of the PMF prior to embankment overtopping. A breach analysis indicates that failure under less than 1/2 PMF conditions could lead to increased downstream damage and potential for loss of life. Thus, based on screening criteria provided in the recommended guidelines, the spillway is considered to be seriously inadequate and the facility unsafe, non-emergency.

It is recommended that the owner immediately:

a. Retain the services of a registered professional engineer experienced in the hydraulics and hydrology of dams to more accurately assess the adequacy of the spillway and prepare recommendations for remedial measures deemed necessary to make the facility hydraulically adequate.

b. Develop a formal emergency warning system to notify downstream inhabitants should hazardous embankment conditions develop. Included in the plan should be provisions for around-

the-clock surveillance of the facility during periods of unusually heavy precipitation.

c. Remove all forms of excess vegetation from the embankment slopes and immediate downstream area as part of a regular maintenance program in order to afford an unobstructed view of the facility.

d. Provide adequate erosion protection along the sidewalls of the emergency spillway discharge channel.

e. Drain and clear the area along the downstream embankment toe at the common outlet of both the service spillway and outlet conduit to provide for unimpeded discharge.

f. Make necessary repairs to prevent or control corrosion of the service spillway riser and operate the drawdown mechanism on a regular basis to ensure its proper function. In addition, repair or replace the partially dislodged trash screen inside the drop inlet.

g. Remove the rocks from the small depression in the embankment crest and backfill with compacted earth materials. The site should be observed in future inspections, and, if the depression again begins to develop, the situation should be investigated in order to determine the origin of the depression.

h. Develop formal manuals of operation and maintenance to ensure the future proper care of the facility.

GAI Consultants, Inc.

Bernard M. Mihalcin, P.E.

Approved by:

JAMES W. PECK
Colonel, Corps of Engineers
Commander and District Engineer

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
BERNARD M. MIHALCIN
ENGINEER
20371-E

Date 3 JUNE 1981

Date 19 JUNE 1981

OVERVIEW PHOTOGRAPH

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
FAWN LAKE DAM
NDI# PA-00822, PENNDER# 52-182

SECTION 1
GENERAL INFORMATION

1.0 Authority.

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

1.1 Purpose.

The purpose is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Fawn Lake Dam is an earth embankment approximately 22 feet high and 808 feet long, including emergency spillway. The facility is constructed with both service and emergency spillways. The service spillway is an 18-inch diameter, 1/4-inch steel, drop inlet type, vertical riser pipe located along the upstream embankment face about 250 feet from the right abutment. The emergency spillway is an uncontrolled, trapezoidal shaped, earth cut, rock lined channel located at the left abutment. Drawdown capability is reportedly provided by means of a 12-inch diameter pipe, controlled at the inlet, which discharges through the service spillway conduit.

b. Location. Fawn Lake Dam is located on a branch of Hornbecks Creek in Delaware Township, Pike County, Pennsylvania. The facility is located about 2,500 feet east of Wild Acres Lake and less than four miles east of U.S. Route 209, which parallels the Delaware River. The dam, reservoir and watershed are contained within the Lake Maskenozha, Pennsylvania-New Jersey, 7.5 minute U.S.G.S. topographic quadrangle (see Figure 1, Appendix E). The coordinates of the dam are N41° 13.0' and W74° 56.0'.

c. Size Classification. Small (22 feet high, 68 acre-feet storage capacity at top of dam).

d. Hazard Classification. High (see Section 3.1.e).

e. Ownership. Marcon, Inc.
155 Willowbrook Boulevard
P. O. Box 460
Wayne, New Jersey 07470
Attn: Joseph J. Marone
Vice-President

f. Purpose. Recreation.

g. Historical Data. No substantial information relative to the history of Fawn Lake Dam was obtained by the inspection team from either the owner or PennDER. The owner's technical subsidiary, Monroe Engineering, Inc., provided a plan view drawing of the facility dated February, 1966 (see Figure 2). The drawing represents the only dated information available; however, field inspection indicates that the drawing does not depict as-built conditions. The owner's representative indicated that personnel turnovers have depleted the staff at Monroe Engineering, Inc. of anyone who might have been involved in the design of the facility. It is noted that the U.S.G.S. 7.5 minute topographic quadrangle, Lake Maskenozha, Pennsylvania-New Jersey, indicates that the facility was completed by 1973 (date of revisions in which Fawn Lake was included).

1.3 Pertinent Data.

a. Drainage Area (square miles). 1.6

b. Discharge at Dam Site.

Discharge Capacity of Outlet Conduit - Discharge curves are not available.

Discharge Capacity of Service Spillway at Maximum Pool - Discharge curves are not available.

Discharge Capacity of Emergency Spillway at Maximum Pool ≅ 390 cfs (see Appendix D, Sheet 11).

c. Elevations (feet above mean sea level). The following elevations were obtained from field measurements based on the approximate elevation of normal pool at 997.0 feet as estimated from the U.S.G.S. 7.5 minute topographic quadrangle, Lake Maskenozha, Pennsylvania-New Jersey (see Appendix D, Sheet 1 and Appendix E, Figure 1).

Top of Dam	999.7 (field).
Maximum Design Pool	Not known.
Maximum Pool of Record	Not known.
Normal Pool	997.0
Service Spillway Crest	997.0

Emergency Spillway Crest	997.0
Upstream Inlet Invert	Not known.
Downstream Outlet Invert	978.0 (field).
Streambed at Dam Centerline	Not known.
Maximum Tailwater	Not known.

d. Reservoir Length (feet).

Top of Dam	1100
Normal Pool	900

e. Storage (acre-feet).

Top of Dam	68
Normal Pool	44

f. Reservoir Surface (acres).

Top of Dam	11
Normal Pool	7

g. Dam.

Type	Earth.
Length	741 feet (excluding spillway).
Height	22 feet (field measured; embankment crest to downstream outlet invert).
Top Width	Varies; 12 to 18 feet.
Upstream Slope	2.5H:1V
Downstream Slope	2H:1V
Zoning	Not known.
Impervious Core	Not known.
Cutoff	Not known.
Grout Curtain	Not known.

h. Diversion Canal and Regulating Tunnels. None.

i. Service Spillway.

Type	Uncontrolled, 18-inch diameter, 1/4-inch steel, drop inlet type, vertical

		riser pipe connected to a 12-inch diameter, discharge conduit.
	Crest Elevation	997.0 feet.
j.	Emergency Spillway.	
	Type	Uncontrolled, trapezoidal shaped channel located at the left abutment.
	Crest Elevation	997.0 feet.
	Crest Length	67 feet (top width). 10 feet (bottom width).
k.	Outlet Conduit.	
	Type	Reportedly a 12-inch diameter cast iron pipe.
	Length	Not known.
	Closure and Regulating Facilities	Flow through the outlet conduit appears to be controlled at the inlet by a slide gate. (No drawings available).
	Access	The control mechanism is located within the reservoir and is accessible only by boat.

SECTION 2

ENGINEERING DATA

2.1 Design.

a. Design Data Availability and Sources. No design reports, calculations, miscellaneous design data, correspondence, state inspection reports or as-built construction drawings are available from either the owner or the PennDER. A single design drawing was supplied to the inspection team by the owner (see Figure 2, Appendix E). The plan view of the facility depicted in the figure bears little resemblance to the as-built structure; however, the figure also contains foundation test pit data which is of value.

b. Design Features.

1. Embankment. Based primarily on visual observations and field measurements, general statements can be made regarding the embankment design. The dam is a 22-foot high, 808-foot long earth embankment, including spillway. The exposed outer embankment shell consists of hard, rocky soil whose parent material is most likely the glacial till prevalent in the local area. This till is depicted in Figure 2 as foundation material referred to as "hardpan". The downstream embankment face is sloped at 2H:1V while the upstream embankment face is sloped at 2.5H:1V. A layer of riprap partially covers the upstream face and is characterized as relatively small below the pool level and much larger at and above the water line.

2. Appurtenant Structures.

a) Service Spillway. The service spillway consists of an uncontrolled, 18-inch diameter, 1/4-inch steel, drop inlet type, vertical riser pipe located about 250 feet from the right abutment. A welded wire trash screen is provided at the inlet. Flow from the riser is discharged at the downstream embankment toe via a 12-inch diameter, horizontal, discharge conduit.

b) Emergency Spillway. The emergency spillway is an uncontrolled, trapezoidal shaped channel located at the left abutment. The spillway has no regulating weir or well defined control section. Therefore, discharges are regulated strictly by channel slope. The discharge channel roughly parallels the downstream embankment toe until it converges with the original stream about 70 feet below the outlet conduit. The channel floor is rock lined; however, the channel sidewalls lack adequate erosion protection.

c) Outlet Conduit. The outlet conduit is reported to be a 12-inch diameter pipe. The inlet to the conduit is located several feet upstream of the service spillway riser. The conduit is manually controlled at the inlet as evidenced by the control

mechanism protruding through the reservoir surface in Photograph 11. The conduit apparently discharges at the base of the service spillway riser and ultimately at the downstream embankment toe.

c. Specific Design Data and Criteria. Aside from information contained in Figure 2, no design data or information relative to design procedures are available.

2.2 Construction Records.

No construction records are available for the facility.

2.3 Operational Records.

No records of the day-to-day operation of the facility are maintained.

2.4 Other Investigations.

No records concerning formal studies or investigations of Fawn Lake Dam were made available to the inspection team. A seepage evaluation was reportedly conducted on the embankment after construction. Results of the study are not available.

2.5 Evaluation.

There is no formal information available relative to the design and construction of this facility. The structure, based solely on external features and dimensions, appears to be adequately constructed while the structural design appears to generally conform to the standards of modern engineering practice. However, without knowledge of specific design details and parameters or construction techniques, any assessment of the integrity of the structure, particularly at high pools or during overtopping, is highly speculative.

SECTION 3

VISUAL INSPECTION

3.1 Observations.

a. General. The general appearance of the facility suggests the dam and its appurtenances are in fair condition.

b. Embankment. Observations made during the visual inspection reveal the embankment is in fair condition and in need of general maintenance. Most of the embankment is covered with low briars and thick weeds. A large segment of the downstream embankment face to the left of the outlet is overgrown with small trees, while some larger trees inhabit the area immediately beyond the downstream embankment toe. This heavy growth obscures the overall view of the facility from downstream (see Photographs 3 and 8). No evidence of seepage through the downstream embankment face was encountered; however, a small damp area (≅ 25 feet in diameter) was observed between the spillway channel and downstream embankment toe about 350 feet from the left abutment. A small depression was observed along the embankment crest directly above the outlet conduit (see Photograph 10). The depression measured about four feet in diameter and was filled with rocks. Its origin could not be ascertained strictly by visual observation nor was the owner's representative able to contribute any substantive information. No signs of sloughing, animal burrows, or excessive settlement were observed.

c. Appurtenant Structures.

1. Service Spillway. Visual observations suggest that the service spillway is in poor condition. The exposed portion of the drop inlet displays heavy corrosion (see Photographs 2 and 11). Furthermore, the trash screen inside the drop inlet is partially dislodged and appears ineffective. The discharge end of the service spillway conduit is submerged in a local pool at the downstream embankment toe and could not be observed (see Photograph 12).

2. Emergency Spillway. Visual observations suggest that the emergency spillway is in fair condition. The channel is poorly defined at its entrance and along its control section and, as with the overall facility, is in need of general maintenance (see Photographs 5, 6 and 7). Only the channel floor appears adequately protected against erosion with rock. Sizeable areas of erosion were observed along the earth cut sidewalls of the discharge channel that parallels the downstream embankment toe between the outlet conduit and left abutment (see Photographs 8 and 9). About 150 to 200 feet from the left abutment, erosion appears to be encroaching on the downstream embankment toe.

3. Outlet Conduit. The condition of the outlet conduit could not be ascertained as both the inlet and outlet were submerged.

The drawdown mechanism was not operated in the presence of the inspection team nor was it reported to have been operated in recent years. The control stem was observed protruding through the pool surface about 30 feet upstream of the embankment crest; however, close observation was not possible due to lack of access (see Photograph 11).

d. Reservoir Area. The general area surrounding the reservoir is composed of moderate slopes that are primarily forested. No signs of slope distress were observed.

Four other water impounding facilities share portions of the Fawn Lake watershed. They include Little Fawn Lake Dam (no PennDER I.D. No.), located about 1,100 feet upstream of Fawn Lake Dam; Lower Rickards Dam (PennDER I.D. No. 52-103), located about 3,700 feet upstream; Rickards Dam (PennDER I.D. no. 52-82) located about 5,600 feet upstream; and Long Ridge Dam (PennDER I.D. No. 52-185), located about 11,100 feet upstream (see Appendix D, Sheets 12, 13, 14, and 18).

e. Downstream Channel. Discharge from Fawn Lake Dam flows through a steep, narrow and heavily forested valley with steep confining slopes. The first inhabitable structures situated near the streambed are located approximately 6,200 feet downstream of the dam at Camp Log-N-Twig, a seasonal recreation camp. The camp was not in use on the day of the inspection. The structures located near the stream apparently include sleeping and dining facilities. A rough estimate of the number of inhabitants of the facility during the peak season is difficult, but, can be reasonably assumed to be more than a few (three) and as many as several hundred. Thus, based on the high potential for loss of life and property damage, the hazard classification is considered to be high.

It is noted that the dam shown in Figure 1 located 2,900 feet downstream of Fawn Lake Dam was also observed by the field team on the day of the inspection. The facility was found to be drained and in the midst of extensive renovation. The dam appears to be primarily an earthen structure with a concrete spillway section near its centerline. No work was currently being performed at the site. As the owner is unknown and no records or drawings of the completed facility are available from PennDER files, it has not been included in the analysis contained in this report. However, its status should be reevaluated in any future hydrologic and hydraulic assessment of Fawn Lake Dam.

3.2 Evaluation.

The overall condition of the facility based on visual observations is considered to be fair. Deficiencies requiring remedial attention include: 1) removing overgrowth from the embankment slopes; 2) repairing the service spillway, including replacement and restoration of damaged and/or corroded segments and clearing its

presently inundated discharge end; 3) providing adequate erosion protection along the emergency spillway discharge channel sidewalls; 4) assuring the operability of the drawdown mechanism; and 5) removing the rocks from the small depression along the embankment crest and backfilling with compacted impervious materials, and investigating its origin should the depression again begin to develop.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Normal Operating Procedure.

Fawn Lake Dam is essentially a self-regulating facility. Excess inflow passes through the drop inlet service spillway and is discharged at the downstream embankment toe. Inflows in excess of the capacity of the service spillway are stored and/or discharged through the emergency spillway. Under normal operating conditions the outlet conduit is closed. No formal operations manual is available.

4.2 Maintenance of Dam.

The condition of the facility as observed during the inspection is indicative of a general lack of routine maintenance. No formal maintenance manual is available that defines routine maintenance or provides a schedule for its regular performance.

4.3 Maintenance of Operating Facilities.

See Section 4.2 above.

4.4 Warning System.

No formal warning system is presently in effect.

4.5 Evaluation.

No formal operations or maintenance manuals are available for the facility, but, are recommended to ensure the proper care and operation of the facility. In addition, warning system procedures should be formalized and incorporated into these manuals.

SECTION 5

HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

No formal design reports, calculations, or miscellaneous design data are available for the facility.

5.2 Experience Data.

Daily records of reservoir levels and/or spillway discharges are not available.

5.3 Visual Observations.

Visual observations indicate that both the service and emergency spillways are inadequately maintained and in poor and fair condition, respectively. The service spillway riser is corroded and lacks an adequate trash screen at its inlet. The emergency spillway is poorly defined and inadequately protected against erosion. The observed conditions raise serious questions as to how these appurtenances will perform during emergency flood situations.

5.4 Method of Analysis.

The facility has been analyzed in accordance with procedures and guidelines established by the U.S. Army, Corps of Engineers, Baltimore District, for Phase I hydrologic and hydraulic evaluations. The analysis has been performed utilizing a modified version of the HEC-1 program developed by the U.S. Army, Corps of Engineers, Hydrologic Engineering Center, Davis, California. Analytical capabilities of the program are briefly outlined in the preface contained in Appendix D.

5.5 Summary of Analysis.

a. Spillway Design Flood. In accordance with the procedures and guidelines contained in the National Guidelines for Safety Inspection of Dams for Phase I Investigations, the Spillway Design Flood (SDF) for Fawn Lake Dam ranges between the 1/2 PMF (Probable Maximum Flood) and the PMF. This classification is based on the relative size of the dam (small) and the potential hazard of dam failure to downstream developments (high). Since the facility is classified near the lower bounds of the small category, the SDF for the facility is considered to be the 1/2 PMF.

b. Results of Analysis. Fawn Lake Dam was evaluated under near normal operating conditions. That is, the reservoir was

initially at its normal pool elevation of approximately 997.0 feet, the elevation of both the service spillway and emergency spillway crests. The emergency spillway, which consists of an uncontrolled, roughly trapezoidal shaped channel cut through soil and rock at the left abutment, was assumed to be discharging freely. However, the service spillway, which consists of an 18-inch diameter, drop inlet type, vertical riser pipe connected to a 12-inch diameter outlet pipe (which also serves as the low level outlet), was considered to be non-functional for the purpose of analysis. In any event, the capacity of this outlet pipe is not such that it would significantly increase the total discharge capabilities of the dam and reservoir.

Long Ridge Dam, Rickards Dam, Lower Rickards Dam, and Little Fawn Lake Dam, located in succession upstream of Fawn Lake (see Figure 1), were also evaluated in this analysis to determine their effects on Fawn Lake Dam. They, too, were evaluated under near normal operating conditions. That is, the reservoirs were initially at normal pool, the spillways were assumed to be discharging freely, and, the outlet conduits were assumed to be closed. The outflow from each facility was routed directly into the reservoir immediately downstream from it. All pertinent engineering calculations relative to the evaluation of Fawn Lake Dam, including those pertaining to the upstream facilities, are included in Appendix D.

Overtopping analysis (using the modified HEC-1 computer program) indicated that the discharge/storage capacity of Fawn Lake Dam can accommodate only about 15 percent of the PMF prior to embankment overtopping, while Long Ridge Dam, Rickards Dam, Lower Rickards Dam, and Little Fawn Lake Dam can accommodate only about 60 percent, 29 percent, 10 percent, and 6 percent of the PMF, respectively, prior to overtopping. Under the 1/2 PMF (SDF) event, the embankment at Fawn Lake Dam was overtopped for about 8.2 hours by depths of up to 1.1 feet (Appendix D, Summary Input/Output Sheets, Sheets S and T). Since the SDF for Fawn Lake Dam is the 1/2 PMF, it can be concluded that the dam has a high potential for overtopping, and thus for breaching under floods of less than SDF magnitude.

Since Fawn Lake Dam cannot safely pass a flood of at least 1/2 PMF magnitude, the possibility of embankment failure under floods of less than 1/2 PMF intensity was investigated (in accordance with Corps directive ETL-1110-2-234). The possible failures of the upstream dams were not included in this analysis. It is noted, however, that both Lower Rickards Dam and Little Fawn Lake Dam overtop prior to the overtopping of Fawn Lake Dam. Failure of either facility (particularly Lower Rickards Dam and to a lesser extent Little Fawn Lake Dam because of its smaller maximum storage capacity) would likely result in the overtopping and possible failure of Fawn Lake Dam at floods of less than 15 percent PMF.

Several possible alternative failure schemes were examined for Fawn Lake Dam, since it is difficult, if not impossible, to determine exactly how or if a specific dam will fail. The major concern of the breaching analysis is with the impact of the various breach discharges on increasing downstream water surface elevations above those to be expected if breaching did not occur.

The modified HEC-1 computer program was used for the breaching analysis, with the assumption that the breaching of an earth dam would begin once the low area in the embankment crest was overtopped. Also, in routing the outflows downstream, the channel bed was assumed to be initially dry.

Five possible modes of failure were investigated for Fawn Lake Dam. Two sets of breach geometry were evaluated for each of two failure times. The two sets of breach sections chosen were considered to be the minimum and maximum probable failure sections. The two failure times (total time for each breach section to reach its final dimensions) under which the minimum and maximum failure sections were investigated were assumed to be a rapid time (0.5-hour) and a prolonged time (4.0 hours), so that a range of this most sensitive variable might be examined. In addition, an average possible set of breach conditions was analyzed, with a failure time of 1.0-hour (Appendix D, Sheet 23).

The peak breach outflows (resulting from 0.20 PMF conditions) ranged from about 890 cfs for the minimum section-maximum fail time scheme to about 4330 cfs for the maximum section-minimum fail time scheme. The peak outflow for the average breach scheme was 2,200 cfs, compared to the non-breach 0.20 PMF peak outflow of approximately 610 cfs (Appendix D, Sheet 25).

The principal center of damage investigated is located at Camp Log-N-Twig along the banks of Hornbecks Creek, approximately 1.2 miles downstream from Fawn Lake Dam (Section 2, see Figure 1). Within this reach, the 0.20 PMF non-breach outflows remained below the damage levels of the nearby structures. However, the water surface elevations resulting from the breach models were as much as 3.8 feet above the non-breach levels, and in the cases of the more rapid breaches (0.5 and 1.0 hour failure times), above the damage levels of the nearby structures (Appendix D, Sheet 25). It should be noted that the breach analysis was performed under 0.20 PMF conditions. Should an event of greater magnitude occur, it is possible that the peak water surface levels resulting from the breaches would be even higher than those noted above.

The consequences of dam failure can better be envisioned if not only the increase in the height of the floodwave is considered, but also the great increase in momentum of the larger and probably swifter moving volume of water. In addition, there is the possibility that one or more of the upstream dams could fail, which, in combination with the failure of Fawn Lake Dam, could ultimately result in even higher downstream water surface elevations. Therefore, it is concluded that the failure of Fawn Lake Dam is quite

possible, and would most likely lead to increased property damage and possibly loss of life in the downstream regions.

5.6 Spillway Adequacy.

As presented previously, Fawn Lake Dam can accommodate only about 15 percent of the PMF prior to embankment overtopping. It has been shown that should an event of greater magnitude occur, the dam would be overtopped and could possibly fail, resulting in increased potential for property damage and possibly loss of life in the downstream region. Therefore, the spillway system at Fawn Lake Dam is considered to be seriously inadequate.

SECTION 6

EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Embankment. The embankment is considered to be in fair condition, exhibiting a general lack of maintenance. The heavy overgrowth along the embankment slopes obscures an overall view of the facility. A clear view of the embankment, especially the downstream face, is particularly critical during periods of flooding when the reservoir is unusually high and the potential for hazardous seepage is increased. In addition, small trees and saplings, if allowed to mature, may develop extensive root systems which also could eventually aid in the development of hazardous seepage. The small depression observed along the embankment crest is suspicious in appearance, but is not considered to be significant relative to the integrity of the structure, even though its origin and purpose are not known. As a precaution, the rocks within the depression should be removed and replaced with compacted impervious backfill materials.

b. Appurtenant Structures.

1. Service Spillway. The service spillway is considered to be in poor condition and in need of maintenance. Efforts should be made to clear the outlet which is presently inundated. In addition, remedial measures should be implemented to protect the inlet from further corrosion and to repair the trash screen.

2. Emergency Spillway. The emergency spillway is considered to be in fair condition. Specifically, the channel is poorly defined at its entrance and control section, and is not adequately maintained. Furthermore, the spillway discharge channel sidewalls are inadequately protected, and thus, highly susceptible to erosion. To date, erosion has occurred on both sides of the channel and is encroaching toward the downstream embankment toe at an area about 150 to 200 feet from the left abutment. Remedial measures should be implemented immediately to provide adequate erosion protection along the entire spillway channel.

3. Outlet Conduit. Observation of the outlet conduit was not possible due to the lack of access to the control mechanism. The operability of the conduit is questionable, at present. The conduit should be operated regularly to insure its ability to function.

6.2 Design and Construction Techniques.

No information is available that details the methods of design and/or construction.

6.3 Past Performance.

No records relative to the performance history of this facility are available. A seepage study was reportedly conducted after construction, which indicates questionable performance. The owner's representative stated, however, that the embankment had never been overtopped to his knowledge.

6.4 Seismic Stability.

The dam is located in Seismic Zone No. 1 and may be subject to minor earthquake induced dynamic forces. As the facility appears adequately constructed and sufficiently stable, it is believed it can withstand the expected dynamic forces; however, no calculations and/or investigations were performed to confirm this opinion.

SECTION 7

ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The results of this investigation indicate the facility is in fair condition.

The size classification of the facility is small and its hazard classification is considered to be high. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) for the facility ranges between the 1/2 PMF (Probable Maximum Flood) and the PMF. Results of the hydrologic and hydraulic analysis indicate the facility will pass and/or store only about 15 percent of the PMF prior to embankment overtopping. A breach analysis indicates that failure under less than 1/2 PMF conditions could lead to increased downstream damage and potential for loss of life. Thus, based on screening criteria provided in the recommended guidelines, the spillway is considered to be seriously inadequate and the facility unsafe, non-emergency.

b. Adequacy of Information. The available data are considered sufficient to make a reasonable Phase I assessment of the facility.

c. Urgency. The recommendations listed below should be implemented immediately.

d. Necessity for Additional Investigations. Additional hydrologic/hydraulic investigations are considered necessary to more accurately assess the adequacy of the spillway.

7.2 Recommendations/Remedial Measures.

It is recommended that the owner immediately:

a. Retain the services of a registered professional engineer experienced in the hydraulics and hydrology of dams to more accurately assess the adequacy of the spillway and prepare recommendations for remedial measures deemed necessary to make the facility hydraulically adequate.

b. Develop a formal emergency warning system to notify downstream inhabitants should hazardous embankment conditions develop. Included in the plan should be provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

c. Remove all forms of excess vegetation from the embankment slopes and immediate downstream area as part of a regular maintenance program in order to afford an unobstructed view of the facility.

d. Provide adequate erosion protection along the sidewalls of the emergency spillway discharge channel.

e. Drain and clear the area along the downstream embankment toe at the common outlet of both the service spillway and outlet conduit to provide for unimpeded discharge.

f. Make necessary repairs to prevent or control corrosion of the service spillway riser and operate the drawdown mechanism on a regular basis to ensure its proper function. In addition, repair or replace the partially dislodged trash screen inside the drop inlet.

g. Remove the rocks from the small depression in the embankment crest and backfill with compacted impervious materials. The site should be observed in future inspections, and, if the depression again begins to develop, the situation should be investigated in order to determine the origin of the depression.

h. Develop formal manuals of operation and maintenance to ensure the future proper care of the facilty.

APPENDIX A

VISUAL INSPECTION CHECKLIST AND FIELD SKETCHES

CHECK LIST
VISUAL INSPECTION
PHASE 1

NAME OF DAM Fawn Lake Dam STATE Pennsylvania COUNTY Pike

NDI # PA — 00822 PENNDER # 52-182

TYPE OF DAM Earth SIZE Small HAZARD CATEGORY High

DATE(S) INSPECTION 15 October 1980 WEATHER Partly Cloudy TEMPERATURE 60° @ 3:00 PM

POOL ELEVATION AT TIME OF INSPECTION 996.0 feet M.S.L.

TAILWATER AT TIME OF INSPECTION N/A M.S.L.

INSPECTION PERSONNEL	OWNER REPRESENTATIVES	*OTHERS*
B.M. Mihalcin	None	
D.J. Spaeder		
D.L. Bonk		

RECORDED BY B M. Mihalcin

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00822
SURFACE CRACKS	None observed.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	4-foot diameter, rock filled depression located at the downstream edge of the embankment crest directly above the service spillway discharge conduit. Also, erosion evident along the sidewalls of the spillway discharge channel where the channel parallels the downstream embankment toe.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Horizontal - good. Vertical - see "Profile of Dam Crest from Field Survey", Appendix A.
RIPRAP FAILURES	Partially covered with vegetation. Riprap size is relatively small below the pool level and much larger at and above the water line. No erosion apparent. Embankment soil appears very rocky.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good condition.

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00822
DAMP AREAS IRREGULAR VEGETATION (LUSH OR DEAD PLANTS)	A small damp area (≈25 ft in diameter) was observed between the spillway channel and downstream embankment toe about 350 feet from the left abutment.
ANY NOTICEABLE SEEPAGE	None through downstream embankment face.
STAFF GAGE AND RECORDER	None.
DRAINS	None observed.
MISCELLANEOUS	Right half of downstream embankment face is covered with low briars and thick weeds. Left half of downstream embankment face is covered with small maple trees near the center of the embankment with briars and weeds wherever the trees have not taken root. General appearance of inadequate maintenance. Several small pine trees are located along the downstream edge of the embankment crest. Trees have been cut along the upstream edge of the embankment crest, but are now sprouting new shoots.

OUTLET WORKS

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00822
INTAKE STRUCTURE	Submerged, not observed.
OUTLET CONDUIT (CRACKING AND SPALLING OF CONCRETE SURFACES)	Outlet conduit discharges through the service spillway pipe. Neither conduit was observed. Discharge outlet along the downstream embankment toe was not observed as it is submerged in a local pool.
OUTLET STRUCTURE	None.
OUTLET CHANNEL	Rock lined ditch.
GATE(S) AND OPERATIONAL EQUIPMENT	Frame and stem for the control mechanism for the outlet conduit are visible projecting out of the water just upstream of the service spillway drop inlet. Control mechanism was not operated in the presence of the inspection team.

EMERGENCY SPILLWAY

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA- 00822
TYPE AND CONDITION	Uncontrolled, trapezoidal shaped, rock lined channel located at the left abutment.
APPROACH CHANNEL	Rock lined and unobstructed.
SPILLWAY CHANNEL AND SIDEWALLS	Channel bottom is rock lined along its entire length. Channel sidewalls are rock lined for only about 30 feet beyond the control section. Sidewall erosion is evident in several areas along that portion of the channel that parallels the downstream embankment toe.
STILLING BASIN PLUNGE POOL	None.
DISCHARGE CHANNEL	The discharge channel wraps around the left end and parallels the downstream embankment toe. Erosion encroaching on the downstream embankment toe between 150 to 200 feet from the left abutment.
BRIDGE AND PIERS EMERGENCY GATES	None.

SERVICE SPILLWAY

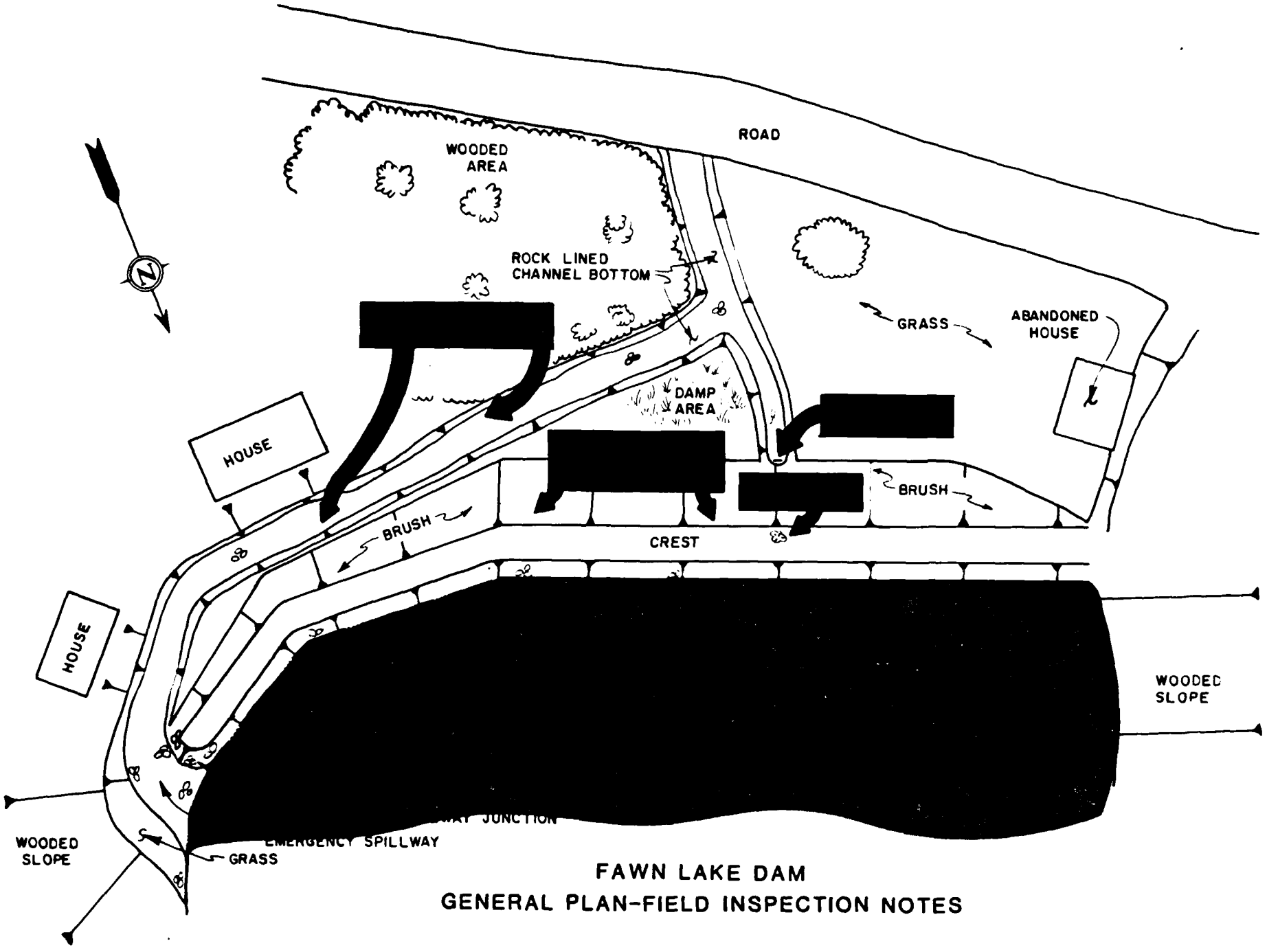
ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00822
TYPE AND CONDITION	18-inch diameter, 1/4-inch steel, drop inlet riser pipe in poor condition. Extensive corrosion evident above pool level. Welded wire trash screen is broken and only partially effective.
APPROACH CHANNEL	N/A.
OUTLET STRUCTURE	None. Pipe discharges along downstream embankment toe. No headwall. Discharge end of conduit is totally submerged in a small local pool.
DISCHARGE CHANNEL	Small rock lined ditch. Unobstructed.

INSTRUMENTATION

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00822
MONUMENTATION SURVEYS	None.
OBSERVATION WELLS	None.
WEIRS	None.
PIEZOMETERS	None.
OTHERS	None.

RESERVOIR AREA AND DOWNSTREAM CHANNEL

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00822
SLOPES: RESERVOIR	Moderate and primarily forested slopes. Watershed is partially developed at present and future expansion is likely.
SEDIMENTATION	None observed.
DOWNSTREAM CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.)	Local road culvert located about 350 feet below the dam.
SLOPES: CHANNEL VALLEY	Steep and heavily forested.
APPROXIMATE NUMBER OF HOMES AND POPULATION	Camp-Log-N-Twig, seasonal recreational camp is located along the banks of the channel about 6,200 feet downstream of Fawn Lake Dam. It is estimated that the camp likely houses as many as several hundred persons during its peak season.

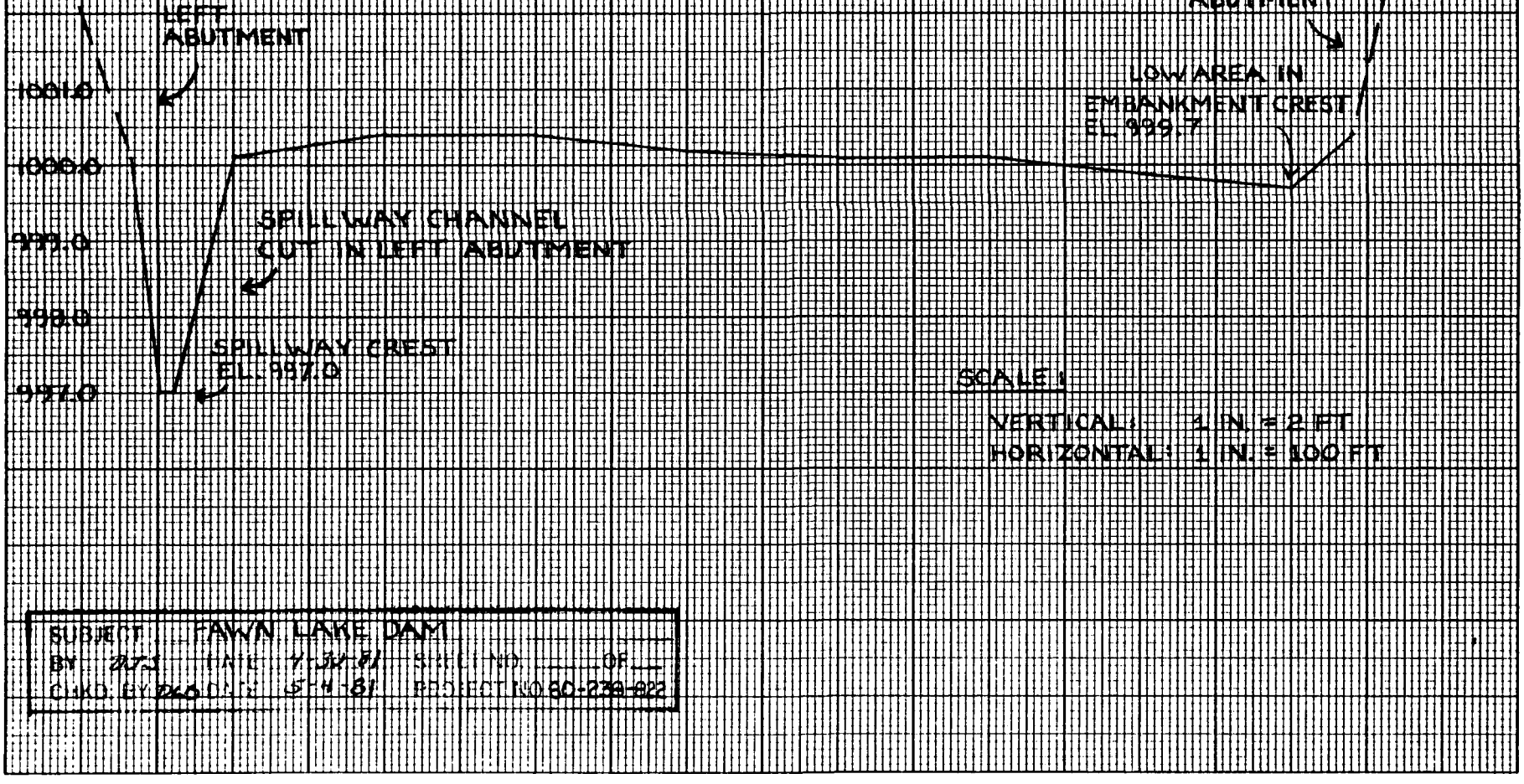


FAWN LAKE DAM
GENERAL PLAN-FIELD INSPECTION NOTES

NDI # PA-00822

FAWN LAKE DAM

PROFILE OF DAM CREST
FROM FIELD SURVEY



SCALE:
VERTICAL: 1 IN. = 2 FT.
HORIZONTAL: 1 IN. = 100 FT.

SUBJECT: FAWN LAKE DAM
BY: DAT-2 DATE: 7-JAN-81 SHEET NO. ___ OF ___
CHKD. BY: DAD DATE: 5-4-81 PROJECT NO. 80-239-822

APPENDIX B

ENGINEERING DATA CHECKLIST

CHECK LIST
ENGINEERING DATA
PHASE I

NAME OF DAM Fawn Lake Dam

ITEM	REMARKS	NDI# PA - 00822
PERSONS INTERVIEWED AND TITLE	Monroe Engineering, Inc. (Subsidiary of Marcon, Inc.) Leonard Tusar - General Manager Interview took place at Wild Acres Lake Dam the day after the inspection of this facility.	
REGIONAL VICINITY MAP	See Figure 1, Appendix E.	
CONSTRUCTION HISTORY	Constructed sometime between 1966 and 1973. Construction permit was never issued by the state.	
AVAILABLE DRAWINGS	Single drawing contained in PennDER files entitled "General Plan, Longitudinal Section", dated February 1966 by Monroe Engineering, Inc. (see Figure 2, Appendix E). Three other drawings in set are not available from owner or PennDER and apparently have been lost.	
TYPICAL DAM SECTIONS	See Figure 2, Appendix E (not as-built).	
OUTLETS: PLAN DETAILS DISCHARGE RATINGS	See Figure 2, Appendix E (not as-built).	

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS NDI# PA - 00822
SPILLWAY: PLAN SECTION DETAILS	See Figure 2, Appendix E (not as-built).
OPERATING EQUIP- MENT PLANS AND DETAILS	None available.
DESIGN REPORTS	None available.
GEOLOGY REPORTS	None available.
DESIGN COMPUTATIONS: HYDROLOGY AND HYDRAULICS STABILITY ANALYSES SEEPAGE ANALYSES	None available.
MATERIAL INVESTIGATIONS: BORING RECORDS LABORATORY TESTING FIELD TESTING	See Figure 2, Appendix E.

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS NDI# PA - 00822
BORROW SOURCES	Not known.
POST CONSTRUCTION DAM SURVEYS	None.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Seepage study reportedly performed in 1977 by Northeast Engineering Company. Several test pits were dug, and a formal report was submitted to the owner but is currently not available.
HIGH POOL RECORDS	No formal records are available.
MONITORING SYSTEMS	None.
MODIFICATIONS	None.

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS	NDI# PA - 00822
PRIOR ACCIDENTS OR FAILURES	None.	
MAINTENANCE: RECORDS MANUAL	No records or manual are available.	
OPERATION: RECORDS MANUAL	No records or manual are available.	
OPERATIONAL PROCEDURES	Self-regulating.	
WARNING SYSTEM AND/OR COMMUNICATION FACILITIES	None.	
MISCELLANEOUS		

GAI CONSULTANTS, INC.

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

NDI ID # PA-00822
PENNDER ID # 52-182

SIZE OF DRAINAGE AREA: 1.6 square miles (total); 0.1-square mile (local).

ELEVATION TOP NORMAL POOL: 997.0 STORAGE CAPACITY: 44 acre-feet

ELEVATION TOP FLOOD CONTROL POOL: - STORAGE CAPACITY: -

ELEVATION MAXIMUM DESIGN POOL: - STORAGE CAPACITY: -

ELEVATION TOP DAM: 999.7 STORAGE CAPACITY: 68 acre-feet

SPILLWAY DATA

CREST ELEVATION: 997.0 feet (service and emergency).

TYPE: 18-inch diameter drop inlet (service); trapezoidal channel (emergency).

CREST LENGTH: (emergency) 67-foot top width, 10-foot bottom width.

CHANNEL LENGTH: Approximately 400 feet.

SPILLOVER LOCATION: 250 feet from right abutment (service); left abutment (emergency).

NUMBER AND TYPE OF GATES: None.

OUTLET WORKS

TYPE: 12-inch diameter pipe.

LOCATION: 250 feet from right abutment.

ENTRANCE INVERTS: Not known.

EXIT INVERTS: 978.0 feet (field).

EMERGENCY DRAWDOWN FACILITIES: Slide gate at inlet.

HYDROMETEOROLOGICAL GAGES

TYPE: None.

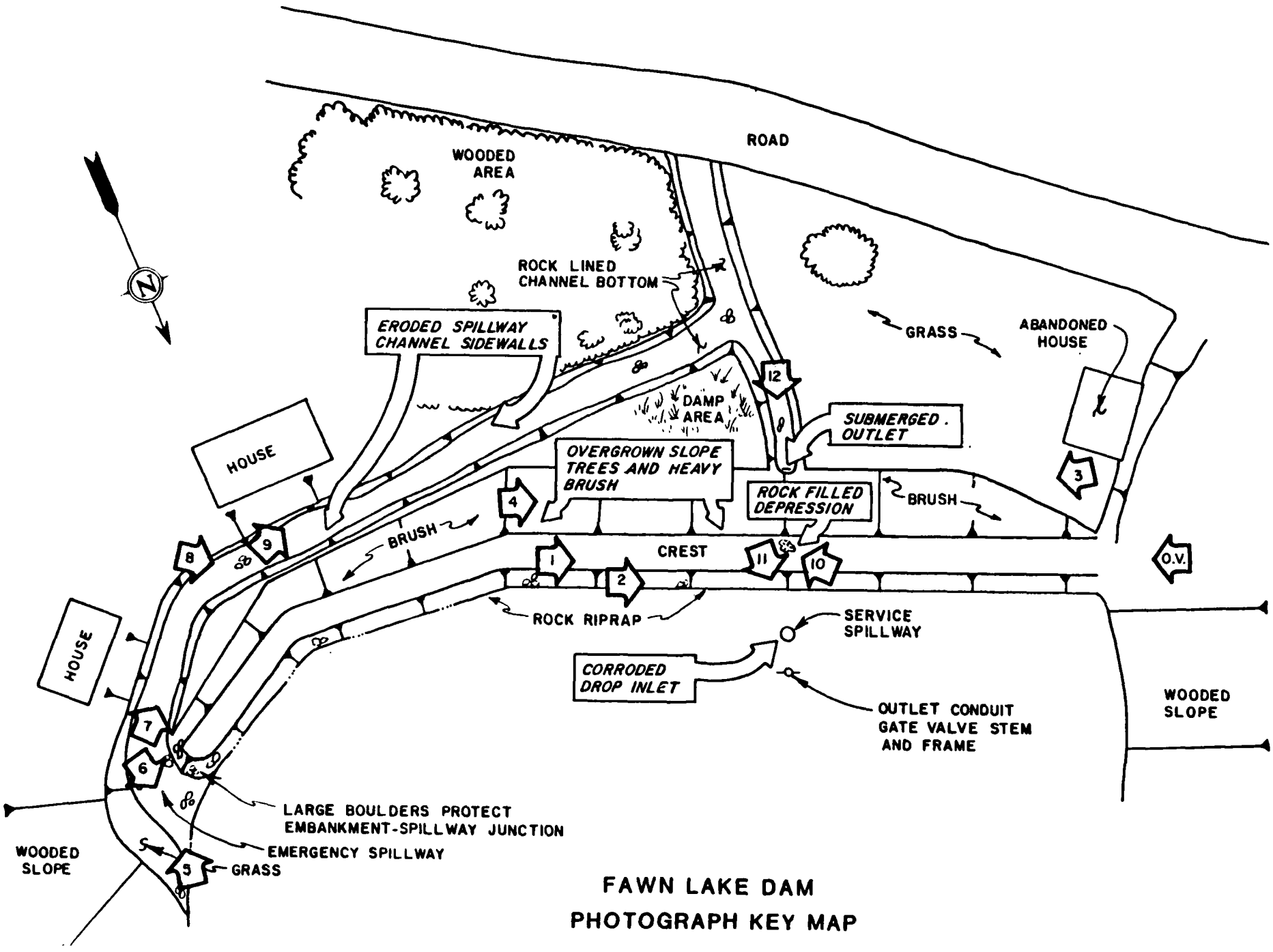
LOCATION: -

RECORDS: -

MAXIMUM NON-DAMAGING DISCHARGE: Not known.

APPENDIX C

PHOTOGRAPHS



FAWN LAKE DAM

PHOTOGRAPH KEY MAP

PHOTOGRAPH 1 View of the embankment crest looking toward the right abutment.

PHOTOGRAPH 2 View of the upstream embankment face looking toward the right abutment and the service spillway drop inlet.

PHOTOGRAPH 3 View of the downstream embankment face as seen from the right abutment.

PHOTOGRAPH 4 Close-up view of the dense vegetation that covers a portion of the downstream embankment face to the left of the outlet conduit.

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PHOTOGRAPH 5 View, looking downstream, of the entrance to the emergency spillway.

PHOTOGRAPH 6 View of the entrance to the emergency spillway looking upstream.

PHOTOGRAPH 7 View, looking downstream, of the emergency spillway channel from a position about 20 feet downstream of the channel entrance.

PHOTOGRAPH 8 View, looking toward the right abutment, of the rock lined spillway discharge channel located along the downstream embankment toe.

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PHOTOGRAPH 9 View of typical erosion evident in several areas along the sidewalls of the spillway discharge channel.

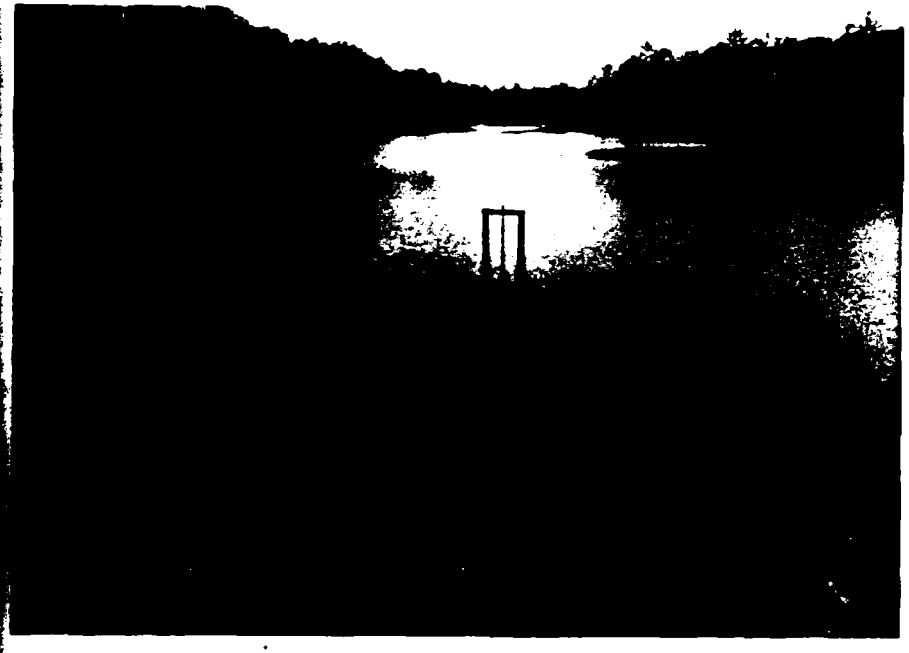
PHOTOGRAPH 10 View of a rock filled depression located at the downstream edge of embankment crest directly above the service spillway discharge conduit.

PHOTOGRAPH 11 View of the service spillway drop inlet and gate stem as seen from the embankment crest.

PHOTOGRAPH 12 View of the area along the downstream embankment toe at which the service spillway and outlet conduit discharge. The discharge outlet is presently inundated and obscured from view.

9

10



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APPENDIX D

HYDROLOGIC AND HYDRAULIC ANALYSES

PREFACE

The modified HEC-1 program is capable of performing two basic types of hydrologic analyses: 1) the evaluation of the overtopping potential of the dam; and 2) the estimation of the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. Briefly, the computational procedures typically used in the dam overtopping analysis are as follows:

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.

c. Routing of the outflow hydrograph(s) from the reservoir to desired downstream locations. The results provide the peak discharge(s), time(s) of occurrence the peak discharge(s), and the maximum stage(s) of each routed hydrograph at the downstream end of each reach.

The evaluation of the hydrologic-hydraulic consequences resulting from an assumed structural failure (breach) of the dam is typically performed as shown below.

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir.

c. Development of a failure hydrograph(s) based on specified breach criteria and normal reservoir outflow.

d. Routing of the failure hydrograph(s) to desired downstream locations. The results provide estimates of the peak discharge(s), time(s) to peak and maximum water surface elevation(s) of failure hydrograph(s) for each location.

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: FAWN LAKE DAM

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.0 INCHES/24 HOURS (1)

STATION	1	2	3
STATION DESCRIPTION	LONG RIDGE DAM	RICKARDS DAM	LOWER RICKARDS DAM
DRAINAGE AREA (SQUARE MILES)	0.10	1.10	0.11
CUMULATIVE DRAINAGE AREA (SQUARE MILES)	0.10	1.20	1.31
ADJUSTMENT OF PMF FOR DRAINAGE AREA LOCATION (%) (1)	ZONE 1	ZONE 1	ZONE 1
6 HOURS	111	111	111
12 HOURS	123	123	123
24 HOURS	133	133	133
48 HOURS	142	142	142
72 HOURS	-	-	-
SNYDER HYDROGRAPH PARAMETERS			
ZONE (2)	1	1	1
C_p (3)	0.45	0.45	0.45
C_t (3)	1.23	1.23	1.23
L (MILES) (4)	-	1.7	-
L_{ca} (MILES) (4)	-	0.7	-
L' (MILES) (4)	0.21	-	0.15
t_p (MILES) (5)	0.48	1.30	0.39
SPILLWAY DATA			
CREST LENGTH (FEET)	10	72	35
FREEBOARD (FEET)	2.1	2.1	1.7

(1) HYDROMETEOROLOGICAL REPORT 33, U.S. CORPS OF ENGINEERS, 1956.
(2) HYDROLOGIC ZONE DEFINED BY CORPS OF ENGINEERS, BALTIMORE DISTRICT, FOR DETERMINATION OF SNYDER COEFFICIENTS (C_p AND C_t).
(3) SNYDER COEFFICIENTS
(4) L = LENGTH OF LONGEST WATERCOURSE FROM DAM TO BASIN DIVIDE
L_{ca} = LENGTH OF LONGEST WATERCOURSE FROM DAM TO POINT OPPOSITE BASIN CENTROID.
L' = LENGTH OF LONGEST WATERCOURSE FROM RESERVOIR INLET TO DRAINAGE DIVIDE.
(5) $t_p = C_t (L \cdot L_{ca})^{0.3}$ or $t_p = C_t (L')^{0.6}$

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: FAWN LAKE DAM

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.0 INCHES/24 HOURS (1)

STATION	4	5	6
STATION DESCRIPTION	LITTLE FAWN LAKE DAM	FAWN LAKE DAM	
DRAINAGE AREA (SQUARE MILES)	0.17	0.10	
CUMULATIVE DRAINAGE AREA (SQUARE MILES)	1.48	1.58	
ADJUSTMENT OF PMF FOR DRAINAGE AREA LOCATION (%) (1)	ZONE 1	ZONE 1	
6 HOURS	111	111	
12 HOURS	123	123	
24 HOURS	133	133	
48 HOURS	142	142	
72 HOURS	-	-	
SNYDER HYDROGRAPH PARAMETERS			
ZONE (2)	1	1	
C_p (3)	0.45	0.45	
C_t (3)	1.23	1.23	
L (MILES) (4)	0.7	0.5	
L_{ca} (MILES) (4)	0.2	0.2	
$t_p = C_t (L \cdot L_{ca})^{0.3}$ (HOURS)	0.68	0.62	
SPILLWAY DATA			
CREST LENGTH (FEET)	8	10	
FREEBOARD (FEET)	2.4	2.7	

(1) HYDROMETEOROLOGICAL REPORT 33, U.S. CORPS OF ENGINEERS, 1956.
(2) HYDROLOGIC ZONE DEFINED BY CORPS OF ENGINEERS, BALTIMORE DISTRICT, FOR DETERMINATION OF SNYDER COEFFICIENTS (C_p AND C_t).
(3) SNYDER COEFFICIENTS
(4) L = LENGTH OF LONGEST WATERCOURSE FROM DAM TO BASIN DIVIDE.
L_{ca} = LENGTH OF LONGEST WATERCOURSE FROM DAM TO POINT OPPOSITE BASIN CENTROID.

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-3-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 1 OF 25

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Environmental Specialists

DAM STATISTICS

HEIGHT OF DAM = 22 FT (FIELD MEASURED: TOP OF DAM TO DOWNSTREAM INVERT OF OUTLET CONDUIT; "TOP OF DAM" HERE AND ON ALL SUBSEQUENT CALCULATION SHEETS REFERS TO THE LOW AREA IN THE EMBANKMENT CREST.)

NORMAL POOL STORAGE CAPACITY = 44 AC-FT (HEC-1)

MAXIMUM POOL STORAGE CAPACITY = 68 AC-FT (HEC-1)
(@ TOP OF DAM)

DRAINAGE AREA:

SUB-AREA (SEE FIG. 1)	LOCAL DRAINAGE AREA (SQ-MI)	CUMULATIVE DRAINAGE AREA (SQ-MI)
LONG RIDGE DAM	0.10	—
RICKARDS DAM	1.10	1.20
LOWER RICKARDS DAM	0.11	1.31
LITTLE FAWN LAKE DAM	0.17	1.48
FAWN LAKE DAM	0.10	1.58

(PLANIMETERED ON USGS TOPO QUAD - LAKE MASKENOZHA, PA.)

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-4-81 PROJ. NO. 80-238-822

CHKD. BY DLA DATE 5-4-81 SHEET NO. 2 OF 25

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ELEVATIONS :

TOP OF DAM (DESIGN)	= NOT KNOWN	
TOP OF DAM (FIELD)	= 999.7	
NORMAL POOL	= 997.0	(SEE NOTE 1)
SERVICE SPILLWAY CREST	= 997.0	(FIELD SURVEY)
EMERGENCY SPILLWAY CREST	= 997.0	(FIELD SURVEY)
UPSTREAM INLET INVERT (DESIGN)	= NOT KNOWN	
DOWNSTREAM OUTLET INVERT (DESIGN)	= NOT KNOWN	
DOWNSTREAM OUTLET INVERT (FIELD)	= 978.0	
STREAMBED @ DAM CENTERLINE	= NOT KNOWN	

NOTE 1: NORMAL POOL ELEVATION ESTIMATED TO BE APPROXIMATELY AT EL. 997, FROM USGS TOPO QUAD - LAKE MASKENOZHA, PA. IT IS NOTED THAT ELEVATIONS USED IN THIS ANALYSIS ARE CONSIDERED ESTIMATES, AND ARE NOT NECESSARILY ACCURATE.

DAM CLASSIFICATION

DAM SIZE: SMALL (REF 1, TABLE 1)

HAZARD CLASSIFICATION: HIGH (FIELD OBSERVATION)

REQUIRED SDF: ½ PMF TO PMF (REF 1, TABLE 3)

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-4-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 3 OF 25

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HYDROGRAPH PARAMETERS

$C_p = 0.45$
$C_t = 1.23$

(SUPPLIED BY C.O.E., ZONE 1, DELAWARE RIVER BASIN)

SUB-AREA (SEE FIG. 1)	L ① (MI)	L_{CA} ② (MI)	L' ③ (MI)	$t_p = C_t (L \cdot L_{CA})^{0.3}$ ④ (HRS)	$t_p = C_t (L')^{0.6}$ ⑤ (HRS)
LONG RIDGE DAM	—	—	0.21	—	0.48
RICKARDS DAM	1.7	0.7	—	1.30	—
LOWER RICKARDS DAM	—	—	0.15	—	0.39
LITTLE FAWN LAKE DAM	0.7	0.2	—	0.68	—
FAWN LAKE DAM	0.5	0.2	—	0.62	—

① L = LENGTH OF LONGEST WATERCOURSE

② L_{CA} = LENGTH OF LONGEST WATERCOURSE FROM DAM TO A POINT OPPOSITE BASIN CENTROID.

③ L' = LENGTH OF LONGEST WATERCOURSE FROM RESERVOIR INLET TO BASIN DIVIDE; USED IN ESTIMATION OF t_p WHEN RESERVOIR LENGTH > L_{CA} (AS PER C.O.E., BALTIMORE DISTRICT; STREAM LENGTHS MEASURED ON USGS TOPO QUAD - LAKE MASKENOZHA, PA.)

④ FROM REF. 2.

⑤ USED WHEN ④ NOT APPLICABLE; SEE ③.

(NOTE: HYDROGRAPH VARIABLES USED HERE ARE DEFINED IN REF 2, IN SECTION ENTITLED "SNYDER SYNTHETIC UNIT HYDROGRAPH.")

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-4-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 4 OF 25

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RESERVOIR STORAGE CAPACITY

RESERVOIR SURFACE AREAS:

SURFACE AREA (S.A.) @ NORMAL POOL (EL. 997.0) = 7 ACRES
S.A. @ EL. 1000.0 = 11 ACRES
S.A. @ EL 1020.0 = 20 ACRES

(PLANIMETERED ON USGS TOPO QUAD - LAKE MASKENOZHA, PA)

- S.A. @ TOP OF DAM (EL. 999.7) = 10.6 ACRES

(BY LINEAR INTERPOLATION)

THE "ZERO-STORAGE" ELEVATION IS ASSUMED TO BE AT EL. 978, OR APPROXIMATELY AT THE SAME ELEVATION AS THE DOWNSTREAM INVERT OF THE OUTLET CONDUIT (SEE SHEET 2).

ELEVATION-STORAGE RELATIONSHIP

THE ELEVATION-STORAGE RELATIONSHIP IS COMPUTED INTERNALLY IN THE HEC-1 PROGRAM, BY USE OF THE CONIC METHOD, BASED ON THE GIVEN RESERVOIR SURFACE AREA AND ELEVATION DATA (SEE SUMMARY INPUT/OUTPUT SHEETS).

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-4-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 5 OF 25

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PMP CALCULATIONS

APPROXIMATE RAINFALL INDEX = 22.0 INCHES
(CORRESPONDING TO A DURATION OF 24 HOURS
AND A DRAINAGE AREA OF 200 SQUARE MILES)

(REF. 3, FIG. 1)

DEPTH-AREA-DURATION ZONE 1 (REF 3, FIG 1)

- ASSUME DATA CORRESPONDING TO A 10-SQUARE MILE AREA MAY BE APPLIED TO THIS 1.58-SQUARE MILE BASIN.

DURATION (HRS)	PERCENT OF INDEX RAINFALL
6	111
12	123
24	133
48	142

(REF 3, FIG. 2)

HOP BROOK FACTOR (ADJUSTMENT FOR BASIN SHAPE AND FOR THE LESSER LIKELIHOOD OF A SEVERE STORM CENTERING OVER A SMALL BASIN) FOR A DRAINAGE AREA OF 1.58 SQUARE MILES IS 0.80

(REF 4, p. 48)

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-4-81 PROJ. NO. 80-238-822

CHKD. BY DeB DATE 5-4-81 SHEET NO. 6 OF 25

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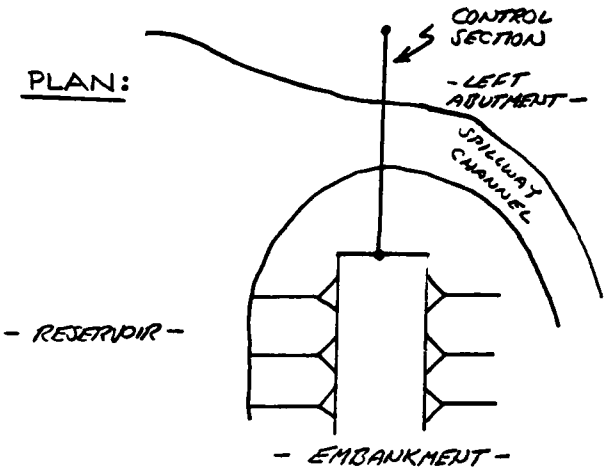
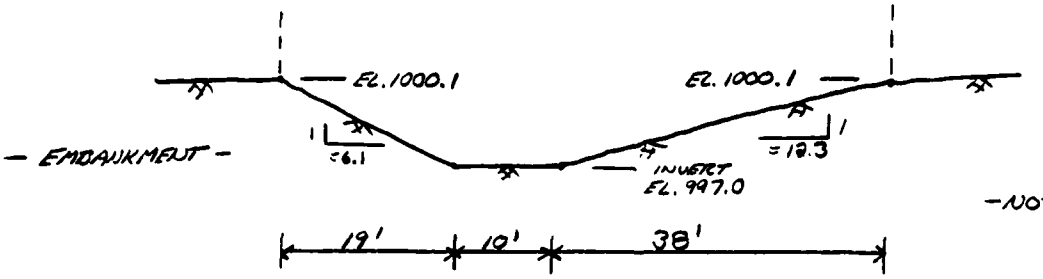
SPILLWAY CAPACITY*

PLAN:



CONTROL SECTION: - LOOKING UPSTREAM -



- NOT TO SCALE -

- SKETCHES BASED ON FIELD NOTES AND OBSERVATIONS. -

THE SPILLWAY CONSISTS OF AN UNCONTROLLED, ROUGHLY TRAPEZOIDAL SHAPED CHANNEL CUT THROUGH SOIL AND ROCK AT THE LEFT ABUTMENT. THE CONTROL SECTION IS LOCATED NEAR THE RESERVOIR OUTLET, AS SHOWN ABOVE.

* - THE DISCHARGE CAPACITY OF THE SERVICE SPILLWAY, WHICH CONSISTS OF AN 18-INCH DIAMETER DROP INLET RISER PIPE AND A 12-INCH DIAMETER OUTLET PIPE, WAS CONSIDERED INSIGNIFICANT.

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-4-81 PROJ. NO. 80-238-822

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BASED ON THE ASSUMPTION OF CRITICAL FLOW AT THE CONTROL SECTION,

$$\frac{Q^2 T}{g A^3} = 1.0 \qquad \text{(REF 5, p. 8-7)}$$

WHERE Q = DISCHARGE, IN CFS,
T = TOP WIDTH OF FLOW AREA, IN FT,
g = GRAVITATIONAL ACCELERATION CONSTANT = 32.2 FT/SEC^2,
A = FLOW AREA, IN FT^2.

ALSO,

$$H_m = D_c + \frac{D_m}{2}$$

AND $D_m = A/T$ (REF 5, p. 8-8)

WHERE H_m = TOTAL HEAD AT CRITICAL DEPTH, OR MINIMUM SPECIFIC ENERGY, IN FT,
D_c = CRITICAL DEPTH, IN FT,
D_m = MEAN DEPTH OF FLOW AREA, IN FT.

THE RESERVOIR ELEVATION CORRESPONDING TO ANY PARTICULAR DISCHARGE IS THEN H_m + 997.0 (WHERE INVERT OF CONTROL SECTION = 997.0). THIS IS BASED ON THE ASSUMPTION OF ZERO-VELOCITY HEAD AT THE RESERVOIR JUST UPSTREAM OF THE CONTROL SECTION, AND NEGLIGIBLE HEAD LOSS TO THE CONTROL SECTION → NO APPROACH LOSSES.

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-6-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 8 OF 25

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SPILLWAY RATING TABLE

D_c (FT)	A ① (FT²)	T ② (FT)	Dm ③ (FT)	Hm ④ (FT)	Q ⑤ (CFS)	RESERVOIR ELEVATION ⑥ (FT)
0.5	7.3	19.2	0.38	0.7	26	997.7
1.0	19.2	28.4	0.68	1.3	90	998.3
1.5	35.7	37.6	0.95	2.0	197	999.0
2.1	61.6	48.6	1.27	2.7	394	999.7 (TOP OF DAM)
2.4	77.0	54.2	1.42	3.1	521	1000.1
2.7	94.1	59.7	1.58	3.5	670	1000.5
3.1	119.4	67.0	1.78	4.0	904	1001.0
3.5	146.2	67.0	2.18	4.6	1225	1001.6
4.0	179.7	67.0	2.68	5.3	1670	1002.3
4.5	213.2	67.0	3.18	6.1	2158	1003.1
5.0	246.7	67.0	3.68	6.8	2686	1003.8

① FOR $D_c < 3.1$, $A = 10D_c + 6.1\left(\frac{D_c^2}{2}\right) + 12.3\left(\frac{D_c^2}{2}\right) = 10D_c + 9.2D_c^2$
FOR $D_c \geq 3.1$, $A = 119.4 + 67(D_c - 3.1)$

② FOR $D_c < 3.1$, $T = 10 + 6.1D_c + 12.3D_c = 10 + 18.4D_c$
FOR $D_c \geq 3.1$, $T = 67.0$

③ $D_m = A/T$

④ $Hm = D_c + Dm/2$

⑤ $Q = \sqrt{gA^3/T}$

⑥ RESERVOIR ELEVATION = $Hm + 997.0$

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-6-81 PROJ. NO. 80-238-822

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EMBANKMENT RATING CURVE

ASSUME THAT THE EMBANKMENT BEHAVES ESSENTIALLY AS A BROAD-CRESTED WEIR WHEN OVERTOPPING OCCURS. THUS, THE DISCHARGE CAN BE ESTIMATED BY THE RELATIONSHIP

$$Q = CLH^{3/2} \qquad \text{(REF 5, p. 5-23)}$$

WHERE Q = DISCHARGE OVER EMBANKMENT, IN CFS,
L = LENGTH OF EMBANKMENT OVERTOPPED, IN FT,
H = HEAD, IN FT; IN THIS CASE, IT IS THE AVERAGE "FLOW AREA WEIGHTED HEAD" ABOVE THE LOW AREA IN THE EMBANKMENT CREST; AND
C = COEFFICIENT OF DISCHARGE, DEPENDENT UPON THE HEAD AND THE WEIR BREADTH.

LENGTH OF EMBANKMENT INUNDATED VS. RESERVOIR ELEVATION:

RESERVOIR ELEVATION (FT)	EMBANKMENT LENGTH (FT)
999.7	0
999.9	110
1000.1	220
1000.2	460
1000.4	650
1000.7	750
1001.0	760
1001.5	770
1002.0	780
1003.0	800
1004.0	820
1005.0	840

(FROM FIELD SURVEY AND USGS TOPO QUAD - LAKE MASKENOZHA, PA;
LT SS = 10H:1V
RT SS = 8H:1V.)

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-6-81 PROJ. NO. 80-228-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 10 OF 25

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ASSUME THAT INCREMENTAL DISCHARGES FOR SUCCESSIVE RESERVOIR ELEVATIONS ARE APPROXIMATELY TRAPEZOIDAL IN CROSS-SECTIONAL FLOW AREA. THEN ANY INCREMENTAL AREA OF FLOW CAN BE ESTIMATED AS $H_i [(L_1+L_2)/2]$, WHERE L_1 = LENGTH OF EMBANKMENT OVERTOPPED AT HIGHER ELEVATION, L_2 = LENGTH AT LOWER ELEVATION, H_i = DIFFERENCE IN ELEVATIONS. THUS, THE TOTAL AVERAGE "FLOW AREA WEIGHTED HEAD" CAN BE ESTIMATED AS H_w = (TOTAL FLOW AREA / L_1).

EMBANKMENT RATING CURVE

RESERVOIR ELEVATION (FT)	L_1 (FT)	L_2 (FT)	INCREMENTAL HEAD, H_i (FT)	INCREMENTAL FLOW AREA, A_i (FT²) ①	TOTAL FLOW AREA, A_T (FT²)	WEIGHTED HEAD, H_w (FT) ②	H_w/l ③	C ④	Q ⑤ (CFS)
999.7	0	—	—	—	—	—	—	—	0
999.9	110	0	0.2	11	11	0.10	0.01	2.93	10
1000.1	220	110	0.2	33	44	0.20	0.01	2.97	60
1000.2	460	220	0.1	34	78	0.17	0.01	2.96	100
1000.4	650	460	0.2	111	189	0.29	0.02	2.99	300
1000.7	750	650	0.3	210	399	0.53	0.04	3.02	870
1001.0	760	750	0.3	227	626	0.82	0.05	3.03	1710
1001.5	770	760	0.5	383	1009	1.3	0.09	3.04	3470
1002.0	780	770	0.5	388	1397	1.8	0.12	3.04	5730
1003.0	800	780	1.0	790	2187	2.7	0.18	3.07	10,900
1004.0	820	800	1.0	810	2997	3.7	0.25	3.08	17,970
1005.0	840	820	1.0	830	3827	4.6	0.31	3.09	25,610

① $A_i = H_i [(L_1+L_2)/2]$
② $H_w = A_T / L_1$
③ l = BREADTH OF CREST = 15 FT (AVG. VALUE; FIELD MEASURED)
④ $C = f(H_w, l)$; FROM REF 12, FIG. 24.
⑤ $Q = C L_1 H_w^{3/2}$ (ROUNDED TO NEAREST 10 CFS)

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-7-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 11 OF 25

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TOTAL FACILITY RATING CURVE

$Q_{TOTAL} = Q_{SPILLWAY} + Q_{EMBANKMENT}$

	RESERVOIR ELEVATION (FT)	① $Q_{SPILLWAY}$ (CFS)	② $Q_{SPILLWAY}$ (CFS)	③ Q_{TOTAL} (CFS)
	997.0	0	–	0
	997.7	30	–	30
	998.3	90	–	90
	999.0	200	–	200
	999.6	370*	–	370
(TOP OF DAM)	999.7	390	0	390
	999.9	460*	10	470
	1000.1	520	60	580
	1000.2	560*	100	660
	1000.4	630*	300	930
	1000.7	760*	870	1630
	1001.0	900	1710	2610
	1001.5	1170*	3470	4640
	1002.0	1480*	5730	7210
	1003.0	2100*	10,900	13,000

* – LINEARLY INTERPOLATED FROM RATING TABLE – SHEET 8
(ROUNDED TO NEAREST 10 CFS)

① FROM RATING TABLE, SHEET 8.
② FROM RATING TABLE, SHEET 12.

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-7-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 12 OF 25

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UPSTREAM DAMS

1) LONG RIDGE DAM:

- HEIGHT OF DAM = 12 FT (SEE NOTE 2)
- ELEVATION OF NORMAL POOL = 1188.0 "
- ELEVATION OF TOP OF DAM = 1190.1 "
- PMP DATA - SEE SHEET 5.

RESERVOIR SURFACE AREA VS. ELEVATION:

	ELEVATION (FT)	S.A. (ACRES)
	1178	0
	1180	2
(NORMAL POOL)	1188	9
(TOP OF DAM)	1190.1	10.6
	1200	18

(SEE NOTE 2)

NOTE 2: DATA TAKEN FROM "PHASE I INSPECTION REPORT," NATIONAL DAM INSPECTION PROGRAM, RICKARDS DAM, PENN DER I.D. No. 52-82, NDI I.D. No. PA-33425, PREPARED BY GAI CONSULTANTS, INC.; JUNE, 1981.

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-7-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 13 OF 25

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LONG RIDGE DAM:

FACILITY RATING TABLE: (SEE NOTE 2)

ELEVATION (FT)	OUTFLOW (CFS)	ELEVATION (FT)	OUTFLOW (CFS)
1188.0	0	1190.5	330
1188.7	20	1190.7	470
1189.4	80	1191.0	730
1190.0	170	1191.3	1050
(TOP OF DAM) 1190.1	190	1191.6	1500
1190.2	210	1192.0	2160
1190.3	240		

2) RICKARDS DAM:

- HEIGHT OF DAM = 9 FT (SEE NOTE 2)
- ELEVATION OF NORMAL POOL = 1077.0 "
- ELEVATION OF TOP OF DAM = 1079.1 (LOW AREA) "

ELEVATION - STORAGE TABLE:

ELEVATION (FT)	STORAGE (AC-FT)	ELEVATION (FT)	STORAGE (AC-FT)
1068.5	0	1080.0	242
1071.1	7	1081.0	312
1073.3	29	1082.0	386
1075.0	56	1083.0	464
(NORMAL POOL) 1077.0	98	1084.0	546
(TOP OF DAM) 1079.1	187	1085.0	632

(SEE NOTE 2)

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-7-81 PROJ. NO. 80-22X-122

CHKD. BY DLB DATE 5-4-81 SHEET NO. 14 OF 25

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RICKARDS DAM:

- PMP DATA – SEE SHEET 5.

- FACILITY RATING TABLE: (SEE NOTE 2)

ELEVATION (FT)	OUTFLOW (CFS)	ELEVATION (FT)	OUTFLOW (CFS)
1077.0	0	1080.5	3800
1078.0	220	1080.7	4620
1079.0	660	1081.0	5640
(TOP OF DAM) 1079.1	720	1081.5	7930
1079.4	1010	1082.0	10,590
1079.5	1110	1083.0	17,090
1079.8	1750	1084.0	24,290
1080.0	2240	1085.0	33,030
1080.2	2810		

3) LOWER RICKARDS DAM:

- HEIGHT OF DAM = 10 FT (FIELD MEASURED: TOP OF DAM TO DOWNSTREAM INVERT OF OUTLET CONDUIT.)

- ELEVATION OF NORMAL POOL = 1070.0 (SEE NOTE 3)

- ELEVATION OF TOP OF DAM = 1071.7 (FIELD SURVEY)

- RESERVOIR CAPACITY:

SURFACE AREAS:

S.A. @ NORMAL POOL (EL. 1070.0) = 15 ACRES

S.A. @ EL. 1080 = 29 ACRES (PLANIMETERED ON USGS TOPO QUAD - LAKE MASKENOZHA

NOTE 3: NORMAL POOL AT LOWER RICKARDS DAM FIELD MEASURED TO BE APPROXIMATELY 7 FT BELOW SPILLWAY CREST AT RICKARDS DAM.

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-7-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 15 OF 25

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LOWER RICKARDS DAM:

S.A. @ TOP OF DAM (EL. 1071.7) = 17.4 ACRES
(BY LINEAR INTERPOLATION)

STORAGE @ NORMAL POOL = 75 AC-FT (SEE NOTE 4)

BY USE OF CONIC METHOD,

VOL. @ NORMAL POOL = $\frac{1}{3}HA$

WHERE H = MAX. DEPTH OF RESERVOIR, IN FT,
A = S.A. @ NORMAL POOL = 15 ACRES

$VOL = \frac{1}{3}HA$
$75 \text{ AC-FT} = \frac{1}{3}H(15)$
$H = 15.0 \text{ FT}$

∴ ZERO STORAGE ASSUMED AT 1070.0 - 15.0 = 1055.0.

THE ELEVATION - STORAGE RELATIONSHIP IS COMPUTED INTERNALLY IN THE HEC-1 PROGRAM, BY USE OF THE CONIC METHOD, BASED ON THE ELEVATION - SURFACE AREA DATA GIVEN ABOVE. ALTHOUGH THE MINIMUM RESERVOIR ELEVATION PROBABLY OCCURS AT SOME ELEVATION ABOVE 1055.0, THIS VALUE MUST BE USED IN THE HEC-1 INPUT IN ORDER TO MAINTAIN A STORAGE OF 75 ACRE-FEET AT NORMAL POOL.

NOTE 4: VOLUME OF RESERVOIR AT NORMAL POOL NOTED IN PHONE CONVERSATION (APRIL 6, 1981) WITH PENN DER REPRESENTATIVE. VOLUME IS REPORTED AS 75 AC-FT IN PENN DER FILES.

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY JJS DATE 4-8-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 16 OF 25

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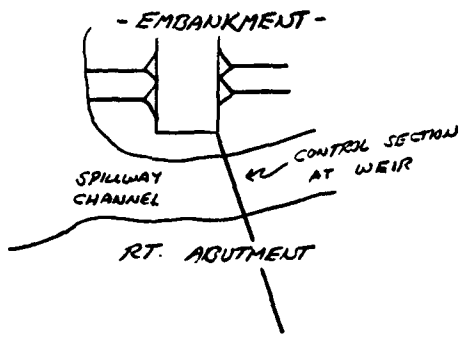
LOWER RICKARDS DAM:

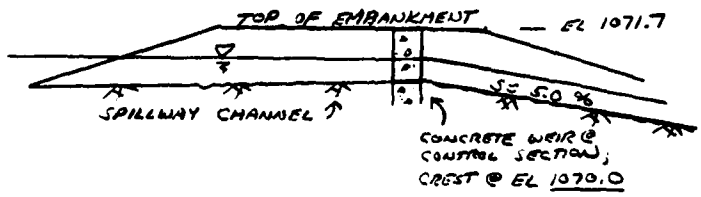
- SPILLWAY CAPACITY:

THE SPILLWAY CONSISTS OF AN UNCONTROLLED, ROUGHLY TRAPEZOIDAL CHANNEL CUT IN SOIL AND ROCK AT THE RIGHT ABUTMENT. THE CONTROL SECTION IS LOCATED AT THE CONCRETE WEIR SHOWN BELOW:

PLAN:



PROFILE:



(BASED ON FIELD MEASUREMENTS AND OBSERVATIONS)

THE WEIR IS TRAPEZOIDAL IN CROSS-SECTION, WITH AVERAGE SIDE-SLOPES = 1.5H:1V, BOTTOM WIDTH = 30 FT, AND FREEBOARD OF APPROXIMATELY 1.7 FT TO TOP OF DAM. SINCE THE MAXIMUM SPILLWAY DISCHARGE CAPACITY (AT TOP OF DAM) IS SMALL IN COMPARISON TO THE EXPECTED PMF-MAGNITUDE OUTFLOWS, THE WEIR SECTION WILL BE APPROXIMATED AS RECTANGULAR, 35 FT LONG.

DISCHARGE CAN BE ESTIMATED BY THE WEIR EQUATION

$$Q = CLH^{3/2}$$ (REF 5, p. 5-33)

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-9-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 17 OF 25

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LOWER RICKARDS DAM:

WHERE Q = DISCHARGE, IN CFS,
H = HEAD, IN FT,
L = WEIR LENGTH = 35 FT (SEE SHEET 16)
C = COEFFICIENT OF DISCHARGE. A CONSERVATIVE VALUE ON THE ORDER OF 2.7 WILL BE ASSUMED, IN ORDER TO ACCOUNT FOR APPROACH LOSSES TO THE WEIR.

THE SPILLWAY RATING CURVE IS COMPUTED INTERNALLY IN THE HEC-1 PROGRAM, BY USE OF THE WEIR EQUATION AND THE DATA GIVEN ABOVE.

- EMBANKMENT RATING TABLE:

DISCHARGE OVER THE EMBANKMENT WILL BE COMPUTED INTERNALLY IN THE HEC-1 PROGRAM, BASED ON THE WEIR EQUATION

$$Q = CLH^{3/2}$$ (SHEET 16)

THE LENGTH OF EMBANKMENT INUNDATED WILL BE ASSUMED TO REMAIN CONSTANT AT 510 FEET (THE ACTUAL MEASURED EMBANKMENT LENGTH) FOR ALL RESERVOIR ELEVATIONS. THE DISCHARGE COEFFICIENT WILL BE ASSUMED TO BE ON THE ORDER OF 3.0 (REF. 12, FIG 24)

- PMP DATA - SEE SHEET 5.

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-9-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 18 OF 25

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LITTLE FAWN LAKE DAM:

- HEIGHT OF DAM = 9 FT (FIELD MEASURED: TOP OF DAM TO DOWNSTREAM TOE OF EMBANKMENT)
- ELEVATION OF NORMAL POOL = 1010.0 (SEE NOTE 5)
- ELEVATION OF TOP OF DAM = 1012.4 (FIELD SURVEY)
- PMP DATA - SEE SHEET 5.

- RESERVOIR CAPACITY

SURFACE AREAS:

S.A @ NORMAL POOL (EL 1010.0) = 2.5 ACRES

S.A @ EL. 1020.0 = 6.5 ACRES

(PLANIMETERED ON USGS TOPO QUAD - LAKE MASKENOZHA, PA)

S.A. @ TOP OF DAM (EL. 1012.4) = 3.5 ACRES

(BY LINEAR INTERPOLATION)

THE "ZERO-STORAGE" ELEVATION IS ASSUMED TO BE APPROXIMATELY AT THE SAME ELEVATION AS THE DOWNSTREAM EMBANKMENT TOE, EL. 1003.

THE ELEVATION-STORAGE RELATIONSHIP IS COMPUTED INTERNALLY IN THE HEC-1 PROGRAM, BASED ON THE DATA GIVEN ABOVE.

NOTE 5: NORMAL POOL AT LITTLE FAWN LAKE DAM FIELD MEASURED TO BE APPROXIMATELY 13 FT ABOVE NORMAL POOL AT FAWN LAKE DAM.

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-9-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 19 OF 25

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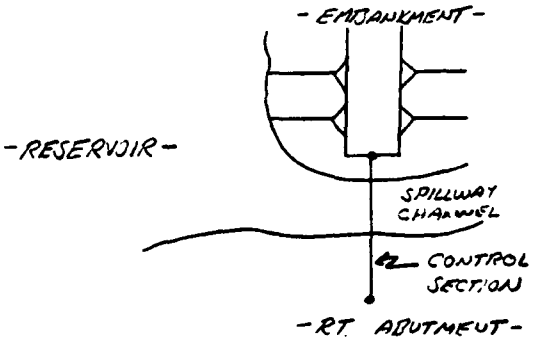
LITTLE FAWN LAKE DAM:

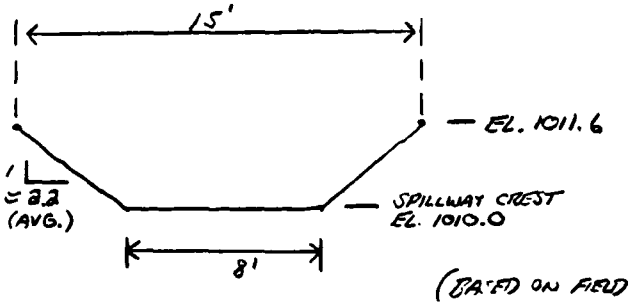
- SPILLWAY CAPACITY:

THE SPILLWAY CONSISTS OF AN UNCONTROLLED, ROUGHLY TRAPEZOIDAL CHANNEL CUT IN SOIL AND ROCK AT THE RIGHT ABUTMENT. THE CONTROL SECTION IS LOCATED NEAR THE RESERVOIR OUTLET, AS SHOWN BELOW.

PLAN:



CROSS-SECTION:



(NOT TO SCALE)

(BASED ON FIELD MEASUREMENTS AND OBSERVATIONS)

THE SPILLWAY RATING TABLE IS PROVIDED ON SHEET 20, AND IS BASED ON THE ASSUMPTION OF CRITICAL DEPTH AT THE CONTROL SECTION, WITH NO APPROACH LOSSES (SEE SHEETS 7 AND 8 FOR ASSUMPTIONS AND METHODOLOGY).

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DDS DATE 4-9-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 20 OF 25

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LITTLE FAWN LAKE DAM:

SPILLWAY RATING TABLE:

D_c (FT)	A ① (FT^2)	T ② (FT)	D_m ③ (FT)	H_m ④ (FT)	Q ⑤ (CFS)	RESERVOIR ELEVATION ⑥ (FT)	
0.0	–	–	–	–	0	1010.0	
0.5	4.6	10.2	0.45	0.7	20	1010.7	
1.0	10.2	12.4	0.82	1.4	50	1011.4	
1.5	17.0	14.6	1.16	2.1	100	1012.1	
1.7	19.9	15.0	1.33	2.4	130	1012.4	(TOP OF DAM)
2.1	25.9	15.0	1.73	3.0	190	1013.0	
2.8	36.4	15.0	2.43	4.0	320	1014.0	
3.5	46.9	15.0	3.13	5.1	470	1015.1	
4.1	55.9	15.0	3.72	6.0	610	1016.0	
4.8	66.4	15.0	4.42	7.0	790	1017.0	
5.5	76.9	15.0	5.12	8.1	990	1018.1	

① FOR $D_c < 1.6$, $A = 8D_c + 2(2.2)(\frac{1}{3})D_c^3 = 8D_c + 2.2D_c^2$
FOR $D_c \geq 1.6$, $A = 18.4 + 15(D_c - 1.6)$

② FOR $D_c < 1.6$, $T = 8 + 2(2.2)D_c = 8 + 4.4D_c$
FOR $D_c \geq 1.6$, $T = 15$

③ $D_m = A/T$

④ $H_m = D_c + D_m/2$

⑤ $Q = \sqrt{gA^3/T}$ (ROUNDED TO NEAREST 10 CFS)

⑥ RESERVOIR ELEVATION $= H_m + 1010.0$

EMBANKMENT RATING TABLE:

DISCHARGE OVER THE EMBANKMENT WILL BE COMPUTED INTERNALLY IN THE HEC-1 PROGRAM, WITH THE ASSUMPTION THAT CRITICAL DEPTH OCCURS ON THE CREST, AND WITH THE CREST PROFILE REPRESENTED BY A SERIES OF TRAPEZOIDS. THE INPUT DATA IS PROVIDED ON SHEET 21.

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-9-81 PROJ. NO. 80-278-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 21 OF 25

gai CONSULTANTS, INC.
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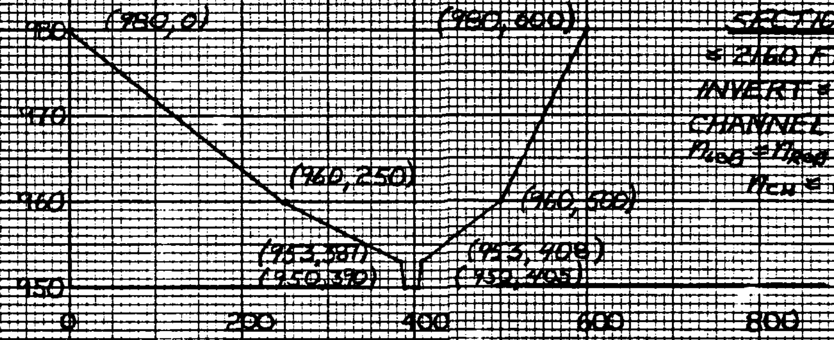
LITTLE FAWN LAKE DAM:

EMBANKMENT OVERTOPPING DATA:

	RESERVOIR ELEVATION (FT)	LENGTH OF EMBANKMENT INUNDATED (FT)
(LOW AREA IN RIGHT ABUTMENT NEAR SPILLWAY)	1011.6	0
(TOP OF DAM)	1012.4	10
	1012.7	50
	1013.0	90
	1013.2	210
	1013.5	300
	1014.0	350
	1015.0	360
	1016.0	370
	1018.0	390

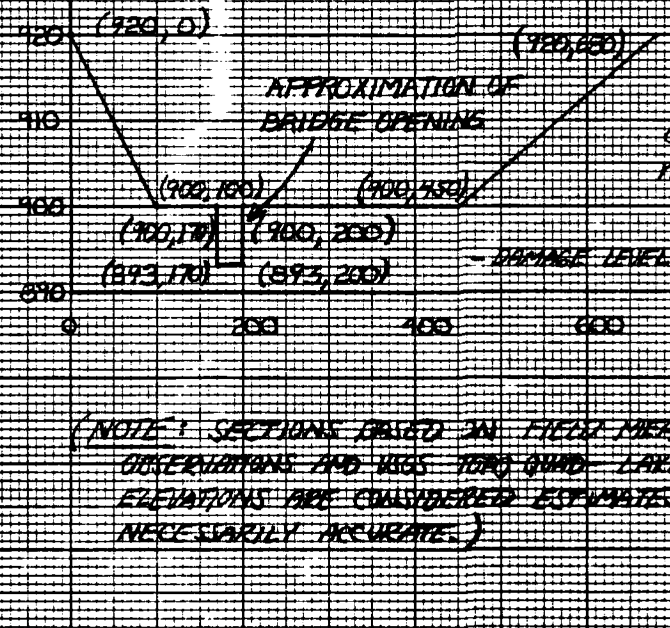
(BASED ON FIELD SURVEY AND USGS TOPO QUAD - LAKE MASKENOZHA, PA)

DOWNSTREAM ROUTING SECTIONS



SECTION 1

≈ 2160 FT D.S. FROM DAM
INVERT ≈ 950.0
CHANNEL SLOPE ≈ 0.010
$n_{LOB} = n_{ROB} = 0.080$
$n_{CH} = 0.040$



SECTION 2

≈ 6160 FT D.S. FROM DAM
INVERT ≈ 893.0
CHANNEL SLOPE ≈ 0.013
$n_{LOB} = n_{ROB} = 0.080$
$n_{CH} = 0.040$

– DAMAGE LEVEL OF STRUCTURES ≈ 4 FT ABOVE CHANNEL INVERT (BELOW TOP OF ROADWAY EMBANKMENT)

(NOTE: SECTIONS BASED ON FIELD MEASUREMENTS AND OBSERVATIONS AND USGS TOPO QUAD - LAKE MASKENOZHA, PA. ELEVATIONS ARE CONSIDERED ESTIMATES AND ARE NOT NECESSARILY ACCURATE.)

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJJ DATE 4-20-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 4-21-81 SHEET NO. 23 OF 25

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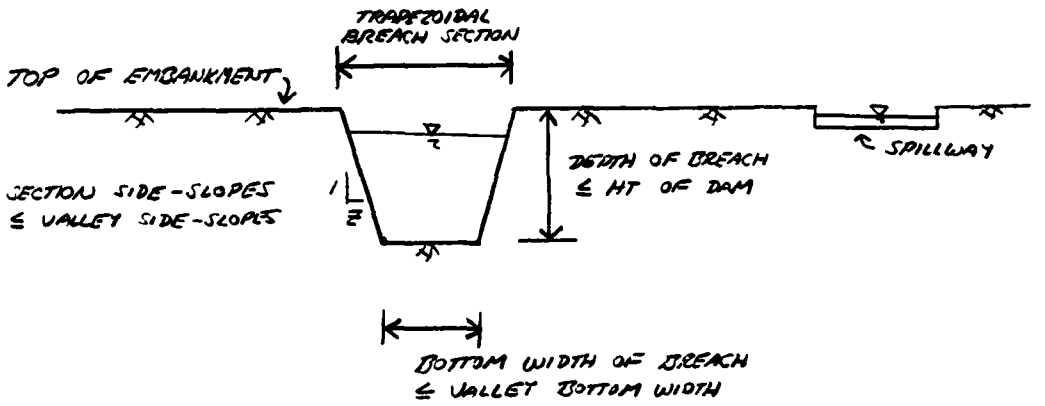
BREACH ASSUMPTIONS

TYPICAL BREACH SECTION:



HEC-1 DAM BREACHING ANALYSIS INPUT:

(BREACHING ASSUMED TO COMMENCE WHEN RESERVOIR LEVEL REACHES MINIMUM EMBANKMENT CREST ELEVATION – 999.7.)

PLAN	BREACH BOTTOM WIDTH (FT)	MAX. BREACH DEPTH (FT)	SECTION SIDE-SLOPES	BREACH TIME (HRS)
① MIN. BREACH SECTION, MIN. FAIL TIME	0	21.7	1H:1V	0.5
② MAX BREACH SECTION, MIN. FAIL TIME	300	21.7	10:1	0.5
③ MIN. BREACH SECTION MAX. FAIL TIME	0	21.7	1:1	4.0
④ MAX. BREACH SECTION MAX. FAIL TIME	300	21.7	10:1	4.0
⑤ AVERAGE POSSIBLE CONDITIONS	60	21.7	1:1	1.0

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-20-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 4-21-81 SHEET NO. 24 OF 25

gai CONSULTANTS, INC.
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THE BREACH ASSUMPTIONS LISTED ON THE PREVIOUS SHEET ARE BASED ON THE SUGGESTED RANGES PROVIDED BY THE C.O.E. (BALTIMORE DISTRICT), AND ON THE PHYSICAL CONSTRAINTS OF THE DAM AND SURROUNDING TERRAIN:

- DEPTH OF BREACH = 21.7 FT (TOP OF DAM TO INVERT OF OUTLET CONDUIT)
- LENGTH OF BREACHABLE EMBANKMENT = 740 FT (FIELD MEASURED)
- VALLEY BOTTOM WIDTH = 300 FT (FIELD OBSERVATION)
- VALLEY SIDE-SLOPES ADJACENT TO DAM:

  RIGHT-SIDE: 10H:1V
  LEFT-SIDE: 10H:1V (USGS TOPO QUAD - LAKE MASKENOZHA, PA)

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 4-27-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-4-81 SHEET NO. 25 OF 25

gai CONSULTANTS, INC.
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HEC-1 DAM BREACHING ANALYSIS
OUTPUT SUMMARY:

RESERVOIR DATA: (UNDER 0.20 PMF BASE FLOW CONDITIONS)

PLAN*	ACTUAL MAX. FLOW DURING FAIL TIME (CFS)	CORRESPONDING TIME OF PEAK (HRS)	INTERPOLATED OR HEC-1 ROUTED MAX. FLOW DURING FAIL TIME (CFS)	CORRESPONDING TIME OF PEAK (HRS)	ACTUAL PEAK FLOW THROUGH DAM (CFS)	CORRESPONDING TIME OF PEAK (HRS)	TIME OF INITIAL BREACH (HRS)
①	3004	41.50	3004	41.50	3004	41.50	41.00
②	4327	41.12	3889	41.17	4327	41.12	41.00
③	893	43.58	893	43.67	893	43.58	41.00
④	1110	41.42	1104	41.50	1110	41.42	41.00
⑤	2203	41.42	2115	41.33	2203	41.42	41.00

DOWNSTREAM ROUTING DATA: (UNDER 0.20 PMF BASE FLOW CONDITIONS)

OUTPUT @ SECTION 2; 6160 FT. D.S. FROM DAM

PLAN*	PEAK FLOW (CFS)	CORRESPONDING WATER SURFACE ELEVATION (FT)	WATER SURFACE ELEVATION W/O BREACH (FT)	ELEVATION DIFFERENCE (FT)
①	2173	899.3	895.7	+3.6
②	2265	899.5	895.7	+3.8
③	886	896.4	895.7	+0.7
④	1088	897.0	895.7	+1.3
⑤	1908	898.0	895.7	+2.3

*-SEE SHEET 23.

- DAMAGE LEVEL OF STRUCTURES @ SECTION 2 (CAMP LOG-N-TWIG) APPROXIMATELY @ EL. 897

DAM SAFETY INSPECTION
FAWN LAKE DAM *** OVERTOPPING ANALYSIS, W/ FOUR UPSTREAM FACILITIES ***
10-MINUTE TIME STEP AND 48-HOUR STORM DURATION

JOB SPECIFICATION

NQ	NMR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPNT	NSTAN
300	0	10	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 5 LRTIO= 1
RTIOS= .10 .20 .30 .50 1.00

****

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPHS= LONG RIDGE RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPNT	INAME	ISTAGE	IAUTO
LRD	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.10	0.00	1.58	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

INITIAL & CONSTANT RAINFALL LOSSES AS PER C.O.E.

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= .48 CP= .45 NTA= 0

BASE FLOW PARAMETERS AS PER C.O.E.

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 3.15 AND R= 4.32 INTERVALS

UNIT HYDROGRAPH 25 END-OF-PERIOD ORDINATES, LAG= .48 HOURS, CP= .45 VOL= 1.00

10.	36.	58.	58.	47.	37.	29.	23.	18.	15.
12.	9.	7.	6.	5.	4.	3.	2.	2.	1.
1.	1.	1.	1.	0.					

	RAIN	EXCS	LOSS	COMP Q
SUM	24.99	22.60	2.39	8749.
	(635.)	(574.)	(61.)	(247.74)

OVERTOPPING ANALYSIS

SUMMARY INPUT/OUTPUT SHEETS

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM
BY RTS DATE 4-28-81 PROJ. NO. 80-338-822
CHKD. BY DLB DATE 5-6-81 SHEET NO. 4 OF 22

CJC CONSULTANTS, INC.
Engineers • Geologists • Planners
Environmental Specialists

SUBJECT DAM SAFETY INSPECTION

FAWN LAKE DAM

BY DLB DATE 4-28-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-6-81 SHEET NO. 13 OF EE

UNITED CONSULTANTS, INC.

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Environmental Specialists

LONG RIDGE RESERVOIR INFLOW

0.1 PMF

	PEAK	6-HOUR	24 HOUR	72-HOUR	TOTAL VOLUME
CFS	43.	20.	6.	3.	611.
CMS	1.	1.	0.	0.	25.
INCHES		1.82	2.22	2.27	2.27
MM		46.14	56.32	57.54	57.54
AC-FT		10.	12.	12.	12.
THOUS CU M		12.	15.	15.	15.

0.2 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	85.	39.	12.	6.	1763.
CMS	2.	1.	0.	0.	50.
INCHES		3.63	4.43	4.53	4.53
MM		92.28	112.64	115.08	115.08
AC-FT		19.	24.	24.	24.
THOUS CU M		24.	29.	30.	30.

0.3PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	128.	59.	18.	9.	2630.
CMS	4.	2.	1.	0.	74.
INCHES		5.45	6.65	6.80	6.80
MM		138.43	168.96	172.61	172.61
AC-FT		29.	35.	36.	36.
THOUS CU M		36.	44.	45.	45.

0.5PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	213.	98.	30.	15.	4383.
CMS	6.	3.	1.	0.	124.
INCHES		9.08	11.09	11.33	11.33
MM		230.71	281.60	287.69	287.69
AC-FT		48.	59.	60.	60.
THOUS CU M		60.	73.	74.	74.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	427.	195.	60.	29.	8767.
CMS	12.	6.	2.	1.	248.
INCHES		18.17	22.17	22.65	22.65
MM		461.42	563.20	575.38	575.38
AC-FT		97.	118.	121.	121.
THOUS CU M		119.	146.	149.	149.

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HYDROGRAPH ROUTING

ROUTE THROUGH LONG RIDGE RESERVOIR

	ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	LRD	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

	NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
	1	0	0	0.000	0.000	0.000	-1188.	-1

STAGE	1188.00	1188.70	1189.40	1190.00	1190.10	1190.20	1190.30	1190.50	1190.70
	1191.30	1191.60	1192.00						

SUBJECT DAM SAFETY INSPECTION

FAWN LAKE DAM

BY DTS DATE 4-28-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-6-81 SHEET NO. C OF EE

CONSULTANTS, INC.

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LONG RIDGE RESERVOIR OUTFLOW

FLOW	0.00	20.00	80.00	170.00	190.00	210.00	240.00	330.00
	1050.00	1500.00	2160.00					
SURFACE AREA=	0.	2.	9.	11.	18.			
CAPACITY=	0.	1.	42.	63.	203.			
ELEVATION=	1178.	1180.	1188.	1190.	1200.			

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1186.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1190.1	0.0	0.0	0.

0.1 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	17.	14.	5.	3.	798.
CMS	0.	0.	0.	0.	23.
INCHES		1.29	2.02	2.06	2.06
MM		32.72	51.42	52.36	52.36
AC-FT		7.	11.	11.	11.
THOUS CU M		8.	13.	14.	14.

0.2PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	46.	30.	11.	5.	1626.
CMS	1.	1.	0.	0.	46.
INCHES		2.83	4.13	4.20	4.20
MM		71.94	104.83	106.72	106.72
AC-FT		15.	22.	22.	22.
THOUS CU M		19.	27.	28.	28.

0.3PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	75.	49.	17.	8.	2473.
CMS	2.	1.	0.	0.	70.
INCHES		4.56	6.28	6.39	6.39
MM		115.83	159.48	162.32	162.32
AC-FT		24.	33.	34.	34.
THOUS CU M		30.	41.	42.	42.

0.5PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	146.	97.	29.	14.	4186.
CMS	4.	2.	1.	0.	119.
INCHES		8.12	10.63	10.82	10.82
MM		206.37	270.04	274.77	274.77
AC-FT		41.	57.	58.	58.
THOUS CU M		53.	70.	71.	71.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	375.	183.	58.	28.	8486.
CMS	11.	5.	2.	1.	240.
INCHES		17.06	21.56	21.93	21.93
MM		433.44	547.51	556.96	556.96
AC-FT		91.	115.	117.	117.
THOUS CU M		112.	142.	144.	144.

SUB-AREA RUNOFF COMPUTATION

LOCAL INFLOW- RICKARDS DAM RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
RD	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	1.10	0.00	1.58	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 1.30 CP= .45 NTA= 0

RECESSION DATA

STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 0.13 AND R=12.53 INTERVALS

UNIT HYDROGRAPH 71 END-OF-PERIOD ORDINATES, LAG= 1.30 HOURS, CP= .45 VOL= 1.00

10.	37.	76.	122.	169.	209.	236.	248.	241.	223.
206.	190.	176.	162.	150.	138.	128.	118.	109.	100.
93.	86.	79.	73.	67.	62.	57.	53.	49.	45.
42.	39.	36.	33.	30.	28.	26.	24.	22.	20.
19.	17.	16.	15.	14.	13.	12.	11.	10.	9.
8.	8.	7.	7.	6.	6.	5.	5.	4.	4.
4.	4.	3.	3.	3.	3.	2.	2.	2.	2.
2.									

	RAIN	EXCS	LOSS	COMP Q
SUM	24.99	22.60	2.39	94837.
	(635.)	(574.)	(61.)	(2685.48)

SUBJECT DAM SAFETY INSPECTION

FAWN LAKE DAM

BY JJS DATE 4-28-81 PROJ. NO. 80-238-822

CHKD. BY DLG DATE 5-6-81 SHEET NO. 22 OF EE

JJR CONSULTANTS, INC.
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SUBJECT DAM SAFETY INSPECTION

FAWN LAKE DAM

BY DSS DATE 4-28-81 PROJ. NO. 80-238-822

CHKD. BY DLA DATE 5-6-81 SHEET NO. E OF EE

LOCAL INFLOW- RICKARDS DAM

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	275.	185.	65.	32.	9478.
CMS	8.	5.	2.	1.	268.
INCHES		1.57	2.18	2.23	2.23
MM		39.82	55.50	56.55	56.55
AC-FT		92.	128.	131.	131.
THOUS CU M		113.	158.	161.	161.

0.10 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	551.	371.	129.	63.	18957.
CMS	16.	10.	4.	2.	537.
INCHES		3.14	4.37	4.45	4.45
MM		79.64	110.99	113.11	113.11
AC-FT		184.	256.	261.	261.
THOUS CU M		227.	318.	322.	322.

0.20PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	826.	556.	194.	95.	28435.
CMS	23.	16.	5.	3.	805.
INCHES		4.70	6.55	6.68	6.68
MM		119.46	166.49	169.66	169.66
AC-FT		276.	384.	392.	392.
THOUS CU M		340.	474.	483.	483.

0.30 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1377.	927.	323.	158.	47392.
CMS	39.	26.	9.	4.	1342.
INCHES		7.84	10.92	11.13	11.13
MM		199.10	277.48	282.77	282.77
AC-FT		460.	641.	653.	653.
THOUS CU M		567.	790.	805.	805.

0.50 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2754.	1854.	646.	316.	94784.
CMS	78.	52.	18.	9.	2684.
INCHES		15.68	21.85	22.27	22.27
MM		398.20	554.97	565.54	565.54
AC-FT		919.	1281.	1306.	1306.
THOUS CU M		1134.	1580.	1610.	1610.

PMF

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CUMBINE HYDROGRAPHS

CUMBINE LONG RIDGE DAM OUTFLOW WITH RICKARDS DAM RESERVOIR LOCAL INFLOW

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
HD	2	0	0	0	0	1	0	0

SUM OF RICKARDS DAM LOCAL INFLOW AND LONG RIDGE DAM OUTFLOW.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	291.	199.	70.	34.	10276.
CMS	8.	6.	2.	1.	291.
INCHES		1.54	2.17	2.21	2.21
MM		39.10	55.16	56.21	56.21
AC-FT		98.	139.	142.	142.
THOUS CU M		121.	171.	175.	175.

0.10 PMF

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SUBJECT DAM SAFETY INSPECTION — FAWN LAKE DAM

BY JJS DATE 4-30-81 PROJ. NO. 80-238-822

CHKD. BY DAG DATE 5-6-81 SHEET NO. E OF EE

GAI CONSULTANTS, INC.

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0.20 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	596.	401.	140.	69.	20583.
CMS	17.	11.	4.	2.	583.
INCHES		3.11	4.35	4.43	4.43
MM		78.90	110.48	112.58	112.58
AC-FT		199.	278.	284.	284.
THOUS CU M		245.	343.	350.	350.

0.30 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	901.	605.	211.	103.	30908.
CMS	26.	17.	6.	3.	875.
INCHES		4.69	6.53	6.66	6.66
MM		119.12	165.91	169.05	169.05
AC-FT		300.	418.	426.	426.
THOUS CU M		370.	515.	525.	525.

0.50 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1523.	1014.	352.	172.	51578.
CMS	43.	29.	10.	5.	1461.
INCHES		7.86	10.90	11.11	11.11
MM		199.71	276.86	282.10	282.10
AC-FT		503.	697.	710.	710.
THOUS CU M		620.	860.	876.	876.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3072.	2035.	704.	344.	103270.
CMS	87.	58.	20.	10.	2924.
INCHES		15.78	21.82	22.24	22.24
MM		400.78	554.35	564.83	564.83
AC-FT		1009.	1396.	1422.	1422.
THOUS CU M		1245.	1722.	1755.	1755.

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HYDROGRAPH ROUTING

ROUTE TOTAL HYDROGRAPH THROUGH RICKARDS DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
RD	1	0	0	0	0	1	0	0

ROUTING DATA

OLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1077.	-1

STAGE	1077.00	1078.00	1079.00	1079.10	1079.40	1079.50	1079.80	1080.00	1080.20
	1080.70	1081.00	1081.50	1082.00	1083.00	1084.00	1085.00		
FLOW	0.00	220.00	660.00	720.00	1010.00	1190.00	1750.00	2240.00	2810.00
	4620.00	5640.00	7930.00	10590.00	17090.00	24290.00	33030.00		
CAPACITY=	0.	7.	29.	56.	98.	187.	242.	312.	386.	464.
	546.	632.							
ELEVATION=	1069.	1071.	1073.	1075.	1077.	1079.	1080.	1081.	1082.	1083.
	1084.	1085.							

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	AVL
1077.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1079.1	0.0	0.0	0.

OUTFLOW HYDROGRAPHS: RICKARDS DAM

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	205.	171.	66.	32.	9646.
CMS	6.	5.	2.	1.	273.
INCHES		1.33	2.08	2.08	2.08
MM		33.68	51.84	52.76	52.76
AC-FT		85.	131.	133.	133.
THOUS CU M		105.	161.	164.	164.

0.10PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	482.	362.	133.	65.	19491.
CMS	14.	10.	4.	2.	552.
INCHES		2.81	4.12	4.20	4.20
MM		71.37	104.77	106.61	106.61
AC-FT		180.	264.	268.	268.
THOUS CU M		222.	325.	331.	331.

0.20PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	762.	565.	201.	98.	29430.
CMS	22.	16.	6.	3.	833.
INCHES		4.38	6.23	6.34	6.34
MM		111.26	158.21	160.97	160.97
AC-FT		280.	398.	405.	405.
THOUS CU M		346.	491.	500.	500.

0.30PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1411.	969.	338.	165.	49531.
CMS	40.	27.	10.	5.	1403.
INCHES		7.51	10.48	10.67	10.67
MM		190.84	266.31	270.91	270.91
AC-FT		481.	671.	682.	682.
THOUS CU M		593.	827.	842.	842.

0.50PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2977.	2001.	685.	334.	100279.
CMS	84.	57.	19.	9.	2840.
INCHES		15.51	21.23	21.59	21.59
MM		394.01	539.28	548.47	548.47
AC-FT		992.	1358.	1381.	1381.
THOUS CU M		1224.	1675.	1704.	1704.

PMF

****

SUB-AREA RUNOFF COMPUTATION

LOCAL INFLOW- LOWER RICKARDS LAKE

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
LRLD	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.11	0.00	1.50	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CONSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.05	0.00	0.00

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM
BY DJS DATE 4-30-81 PROJ. NO. 80-238-822
CHKD. BY JAG DATE 5-6-81 SHEET NO. 6 OF EE

CONSULTANTS, INC.
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SUBJECT DAM SAFETY INSPECTION

Fawn Lake Dam

BY RJS DATE 4-30-81 PROJ. NO. 80-338-822

CHKD. BY DLG DATE 5-6-81 SHEET NO. 44 OF 55

CONSULTANTS, INC.

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UNIT HYDROGRAPH DATA
TP= .39 CP= .45 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 2.25 AND R= 3.70 INTERVALS

UNIT HYDROGRAPH 22 END-OF-PERIOD ORDINATES, LAG= .39 HOURS, CP= .45 VOL= 1.00

21.	63.	77.	62.	47.	36.	28.	21.	16.	13.
10.	7.	6.	4.	3.	3.	2.	1.	1.	1.
1.	1.								

	MAIN	EXCS	LOSS	COMP Q
SUM	24.99	22.60	2.39	9668.
	(635.11	574.)(	61.)(	273.77)

LOCAL INFLOW-
LOWER RICKARDS
DAM

0.10 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	52.	22.	7.	3.	967.
CMS	1.	1.	0.	0.	27.
INCHES		1.83	2.22	2.27	2.27
MM		46.55	56.48	57.72	57.72
AC-FT		11.	13.	13.	13.
THOUS CU M		13.	16.	16.	16.

0.20 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	103.	43.	13.	6.	1935.
CMS	3.	1.	0.	0.	55.
INCHES		3.67	4.45	4.55	4.55
MM		93.10	112.96	115.44	115.44
AC-FT		21.	26.	27.	27.
THOUS CU M		27.	32.	33.	33.

0.30 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	155.	65.	20.	10.	2902.
CMS	4.	2.	1.	0.	82.
INCHES		5.50	6.67	6.82	6.82
MM		139.65	169.43	173.17	173.17
AC-FT		32.	39.	40.	40.
THOUS CU M		40.	48.	49.	49.

0.50 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	258.	108.	33.	16.	4837.
CMS	7.	3.	1.	0.	137.
INCHES		9.16	11.12	11.36	11.36
MM		232.75	282.39	288.61	288.61
AC-FT		54.	65.	67.	67.
THOUS CU M		66.	80.	82.	82.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	517.	217.	66.	32.	9674.
CMS	15.	6.	2.	1.	274.
INCHES		18.33	22.24	22.73	22.73
MM		465.49	564.78	577.22	577.22
AC-FT		107.	130.	133.	133.
THOUS CU M		133.	161.	164.	164.

SUBJECT DAM SAFETY INSPECTION

FAWN LAKE DAM

BY JJS DATE 5-6-81 PROJ. NO. 80-238-822

CHKD. BY JLG DATE 5-6-81 SHEET NO. 2 OF EE

GEI CONSULTANTS, INC.

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SUM OF RICKARDS DAM OUTFLOW AND LOWER RICKARDS DAM LOCAL INFLOW.

COMBINE RICKARDS DAM OUTFLOW W/ LOWER RICKARDS LAKE INFLOW

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
LRLD	2	0	0	0	0	1	0	0

0.10 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	214.	182.	72.	35.	10613.
CMS	6.	5.	2.	1.	301.
INCHES		1.29	2.06	2.09	2.09
MM		32.89	52.23	53.17	53.17
AC-FT		90.	144.	146.	146.
THOUS CU M		112.	177.	180.	180.

0.20 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	513.	390.	146.	71.	21426.
CMS	15.	11.	4.	2.	607.
INCHES		2.77	4.15	4.23	4.23
MM		70.30	105.45	107.35	107.35
AC-FT		193.	290.	295.	295.
THOUS CU M		238.	358.	364.	364.

0.30 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	813.	609.	221.	108.	32332.
CMS	23.	17.	6.	3.	916.
INCHES		4.32	6.27	6.38	6.38
MM		109.82	159.15	161.99	161.99
AC-FT		302.	438.	445.	445.
THOUS CU M		372	540.	549.	549.

0.50 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1516.	1048.	371.	181.	54368.
CMS	43.	30.	11.	5.	1540.
INCHES		7.44	10.54	10.72	10.72
MM		189.05	267.66	272.39	272.39
AC-FT		520.	736.	749.	749.
THOUS CU M		641.	908.	924.	924.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3223.	2173.	750.	367.	109953.
CMS	91.	62.	21.	10.	3114.
INCHES		15.43	21.32	21.69	21.69
MM		392.00	541.42	550.88	550.88
AC-FT		1078.	1488.	1515.	1515.
THOUS CU M		1329.	1836.	1868.	1868.

HYDROGRAPH ROUTING

ROUTE TOTAL HYDROGRAPH THROUGH LOWER RICKARDS LAKE DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
LRLD	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1070.	0

SURFACE AREA=	0.	15.	17.	29.
CAPACITY=	0.	75.	103.	293.
ELEVATION=	1055.	1070.	1072.	1080.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1070.0	35.0	2.7	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1071.7	3.0	1.5	510.

OUTFLOW HYDROGRAPHS LOWER RICKARDS DAM

0.10PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	196.	172.	67.	32.	9693.
CMS	6.	5.	2.	1.	274.
INCHES		1.22	1.89	1.91	1.91
MM		30.98	48.08	48.56	48.56
AC-FT		85.	132.	134.	134.
THOUS CU M		105.	163.	165.	165.

0.20PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	510.	380.	138.	67.	20155.
CMS	14.	11.	4.	2.	571.
INCHES		2.69	3.93	3.98	3.98
MM		68.45	99.84	100.98	100.98
AC-FT		188.	274.	278.	278.
THOUS CU M		232.	339.	342.	342.

0.30PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	811.	605.	212.	103.	30837.
CMS	23.	17.	6.	3.	873.
INCHES		4.30	6.01	6.08	6.08
MM		109.12	152.65	154.50	154.50
AC-FT		300.	420.	425.	425.
THOUS CU M		370.	518.	524.	524.

0.50PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1513.	1048.	361.	175.	52589.
CMS	43.	30.	10.	5.	1489.
INCHES		7.44	10.24	10.37	10.37
MM		188.97	260.14	263.48	263.48
AC-FT		520.	715.	724.	724.
THOUS CU M		641.	882.	893.	893.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3221.	2173.	739.	360.	107935.
CMS	91.	62.	21.	10.	3056.
INCHES		15.43	21.08	21.29	21.29
MM		392.00	533.50	540.77	540.77
AC-FT		1078.	1467.	1487.	1487.
THOUS CU M		1329.	1809.	1834.	1834.

SUBJECT DAM SAFETY INSPECTION

FAWN LAKE DAM

BY DSS DATE 5-6-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-6-81 SHEET NO. 7 OF 22

GEI CONSULTANTS, INC.

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SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM
BY RJS DATE 5-6-81 PROJ. NO. 80-338-822
CHKD. BY DLB DATE 5-6-81 SHEET NO. K OF EE

CONSULTANTS, INC.
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SUB-AREA RUNOFF COMPUTATION

LOCAL INFLOW- LITTLE FAWN LAKE

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
LFLO	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.17	0.00	1.58	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LKOPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= .68 CP= .45 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 4.46 AND R= 6.37 INTERVALS

UNIT HYDROGRAPH 37 END-OF-PERIOD ORDINATES, LAG= .68 HOURS, CP= .45 VOL= 1.00

7.	27.	51.	69.	71.	63.	54.	46.	39.	34.
29.	25.	21.	18.	15.	13.	11.	10.	8.	7.
6.	5.	4.	4.	3.	3.	2.	2.	2.	1.
1.	1.	1.	1.	1.	1.	0.			

	RAIN	EXCS	LOSS	COMP Q
SUM	24.99	22.60	2.39	14835.
	(635.)	(574.)	(61.)	(420.08)

LOCAL INFLOW - LITTLE FAWN LAKE DAM.

0.10 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	60.	32.	10.	5.	1483.
CMS	2.	1.	0.	0.	42.
INCHES		1.76	2.21	2.25	2.55
MM		44.58	56.10	57.26	57.26
AC-FT		16.	20.	20.	20.
THOUS CU M		20.	25.	25.	25.

0.20 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	121.	64.	20.	10.	2966.
CMS	3.	2.	1.	0.	84.
INCHES		3.51	4.42	4.51	4.51
MM		89.16	112.20	114.51	114.51
AC-FT		32.	40.	41.	41.
THOUS CU M		39.	49.	50.	50.

SUBJECT DAM SAFETY INSPECTION

F[illegible] LAKE DAM

BY DJS DATE [illegible] PROJ. NO. 80-238-822

CHKD. BY DLA DATE 6-6-81 SHEET NO. 6 OF EE

CONSULTANTS, INC.

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0.30PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	181.	96.	30.	15.	4449.
CMS	5.	3.	1.	0.	126.
INCHES		5.27	6.63	6.76	6.76
MM		133.75	168.30	171.77	171.77
AC-FT		48.	60.	61.	61.
THOUS CU M		59.	74.	76.	76.

0.50PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	302.	160.	50.	25.	7415.
CMS	9.	5.	1.	1.	210.
INCHES		8.78	11.04	11.27	11.27
MM		222.91	280.49	286.28	286.28
AC-FT		80.	100.	102.	102.
THOUS CU M		98.	123.	126.	126.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	604.	321.	101.	49.	14830.
CMS	17.	9.	3.	1.	420.
INCHES		17.55	22.09	22.54	22.54
MM		445.82	560.99	572.57	572.57
AC-FT		159.	200.	204.	204.
THOUS CU M		196.	247.	252.	252.

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COMBINE HYDROGRAPHS

COMBINE LOWER RICKARDS LAKE DAM OUTFLOW W/ LITTLE FAWN LAKE INFLOW

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
LFLD	2	0	0	0	0	1	0	0

SUM OF LOWER RICKARDS DAM OUTFLOW AND LITTLE FAWN LAKE INFLOW.

0.10PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	208.	187.	77.	37.	11176.
CMS	6.	5.	2.	1.	316.
INCHES		1.18	1.93	1.95	1.95
MM		29.88	49.00	49.56	49.66
AC-FT		93.	152.	154.	154.
THOUS CU M		114.	188.	190.	190.

0.20PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	573.	424.	159.	77.	23121.
CMS	16.	12.	4.	2.	655.
INCHES		2.67	3.99	4.04	4.04
MM		67.72	101.26	102.53	102.53
AC-FT		210.	315.	318.	318.
THOUS CU M		259.	388.	393.	393.

0.30PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	908.	679.	242.	118.	35286.
CMS	26.	19.	7.	3.	999.
INCHES		4.27	6.08	6.16	6.16
MM		108.46	154.45	156.48	156.48
AC-FT		337.	480.	486.	486.
THOUS CU M		416.	592.	600.	600.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1712.	1183.	411.	200.	60004.
CMS	48.	33.	12.	6.	1699.
INCHES		7.43	10.33	10.48	10.48
MM		188.82	262.48	266.10	266.10
AC-FT		586.	815.	827.	827.
THOUS CU M		723.	1006.	1019.	1019.

0.50 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3666.	2462.	840.	409.	122766.
CMS	104.	70.	24.	12.	3476.
INCHES		15.47	21.13	21.43	21.43
MM		393.01	536.66	544.43	544.43
AC-FT		1221.	1667.	1691.	1691.
THOUS CU M		1506.	2056.	2086.	2086.

PMF

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HYDROGRAPH ROUTING

ROUTE TOTAL HYDROGNAPH THROUGH LITTLE FAWN LAKE DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
LFLD	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1010.	-1

STAGE	1010.00	1010.70	1011.40	1012.10	1012.40	1013.00	1014.00	1015.10	1016.00
FLOW	0.00	20.00	50.00	100.00	130.00	190.00	320.00	470.00	610.00
SURFACE AREA=	0.	3.	4.	7.					
CAPACITY=	0.	6.	13.	50.					
ELEVATION=	1003.	1010.	1012.	1020.					

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
1010.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
1012.4	0.0	0.0	0.

CREST LENGTH	10.	50.	90.	210.	300.	350.	360.	370.	390.
AT OR BELOW ELEVATION	1012.4	1012.7	1013.0	1013.2	1013.5	1014.0	1015.0	1016.0	1018.0

LITTLE FAWN LAKE DAM OUTFLOW HYDROGRAPHS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	207.	186.	74.	36.	10794.
CMS	6.	5.	2.	1.	306.
INCHES		1.17	1.87	1.88	1.88
MM		29.77	47.38	47.87	47.87
AC-FT		92.	147.	149.	149.
THOUS CU M		114.	182.	183.	183.

0.10 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	572.	424.	155.	75.	22621.
CMS	16.	12.	4.	2.	641.
INCHES		2.66	3.91	3.95	3.95
MM		67.66	99.21	100.32	100.32
AC-FT		210.	308.	312.	312.
THOUS CU M		259.	380.	384.	384.

0.20 PMF

SUBJECT DAM SAFETY INSPECTION

FAWN LAKE DAM

BY JJS DATE 5-6-81 PROJ. NO. 80-338-822

CHKD. BY DLB DATE 5-6-81 SHEET NO. 11 OF 55

UCI CONSULTANTS, INC.
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	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	908.	679.	238.	116.	34723.
CMS	26.	19.	7.	3.	983.
INCHES		4.27	5.99	6.06	6.06
MM		108.47	152.21	153.99	153.99
AC-FT		337.	473.	478.	478.
THOUS CU M		416.	583.	590.	590.

0.30 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1713.	1183.	407.	198.	59386.
CMS	48.	33.	12.	6.	1682.
INCHES		7.43	10.24	10.37	10.37
MM		188.85	260.18	263.36	263.36
AC-FT		587.	808.	818.	818.
THOUS CU M		724.	997.	1009.	1009.

0.50 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3668.	2462.	837.	407.	122087.
CMS	104.	70.	24.	12.	3457.
INCHES		15.47	21.04	21.32	21.32
MM		393.00	534.44	541.42	541.42
AC-FT		1221.	1660.	1682.	1682.
THOUS CU M		1506.	2048.	2074.	2074.

PMF

****

SUB-AREA RUNOFF COMPUTATION

LOCAL INFLOW- FAWN LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
FLD	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.10	0.00	1.58	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LKOPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= .62 CP= .45 NTA= 0

RECESSION DATA

STRTQ= -1.50 QRCSN= .05 RTIOR= 2.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 3.81 AND R= 6.01 INTERVALS

UNIT HYDROGRAPH 34 END-OF-PERIOD ORDINATES, LAG= .62 HOURS, CP= .45 VOL= 1.00

6.	21.	37.	45.	43.	36.	31.	26.	22.	19.
16.	13.	11.	10.	8.	7.	6.	5.	4.	3.
3.	3.	2.	2.	2.	1.	1.	1.	1.	1.
1.	0.	0.	0.						

	MAIN	EXCS	LOSS	COMP Q
SUM	24.99	22.60	2.39	8717.
	(635.)	(574.)	(61.)	(246.84)

SUBJECT DAM SAFETY INSPECTION

FAWN LAKE DAM

BY RJS DATE 5-6-81 PROJ. NO. 80-238-822

CHKD. BY DLG DATE 5-6-81 SHEET NO. 14 OF EE

UGI CONSULTANTS, INC.

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SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM
BY JSC DATE 5-6-81 PROJ. NO. 80-238-822
CHKD. BY DLB DATE 5-6-81 SHEET NO. 2 OF EE

GJ CONSULTANTS, INC.
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LOCAL INFLOW-
FAWN LAKE.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	37.	19.	6.	3.	873.
CMS	1.	1.	0.	0.	25.
INCHES		1.77	2.21	2.26	2.26
MM		44.87	56.12	57.29	57.29
AC-FT		9.	12.	12.	12.
THOUS CU M		12.	15.	15.	15.

0.10 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	74.	38.	12.	6.	1746.
CMS	2.	1.	0.	0.	49.
INCHES		3.53	4.42	4.51	4.51
MM		89.74	112.23	114.57	114.57
AC-FT		19.	24.	24.	24.
THOUS CU M		23.	29.	30.	30.

0.20 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	111.	57.	18.	9.	2619.
CMS	3.	2.	1.	0.	74.
INCHES		5.30	6.63	6.77	6.77
MM		134.61	168.35	171.86	171.86
AC-FT		28.	35.	36.	36.
THOUS CU M		35.	44.	44.	44.

0.30 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	185.	95.	30.	15.	4364.
CMS	5.	3.	1.	0.	124.
INCHES		8.83	11.05	11.28	11.28
MM		224.35	280.58	286.44	286.44
AC-FT		47.	59.	60.	60.
THOUS CU M		58.	73.	74.	74.

0.50 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	370.	190.	59.	29.	8720.
CMS	10.	5.	2.	1.	247.
INCHES		17.67	22.09	22.55	22.55
MM		448.70	561.15	572.87	572.87
AC-FT		94.	118.	120.	120.
THOUS CU M		116.	145.	148.	148.

PMF

****

COMBINE HYDROGRAPHS

COMBINE LITTLE FAWN LAKE DAM OUTFLOW W/ FAWN LAKE INFLOW

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	FLD	2	0	0	0	0	1	0	0

SUM OF LITTLE FAWN
LAKE OUTFLOW AND
FAWN LAKE INFLOW.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	217.	196.	80.	39.	11667.
CMS	6.	6.	2.	1.	330.
INCHES		1.15	1.89	1.91	1.91
MM		29.32	47.93	48.46	48.46
AC-FT		97.	159.	161.	161.
THOUS CU M		120.	196.	198.	198.

0.10 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	609.	451.	167.	81.	24367.
CMS	17.	13.	5.	2.	690.
INCHES		2.66	3.94	3.99	3.99
MM		67.51	100.01	101.22	101.22
AC-FT		224.	332.	336.	336.
THOUS CU M		276.	409.	414.	414.

0.20PMF

SUBJECT DAM SAFETY INSPECTION

FAWN LAKE DAM

BY RJS DATE 5-6-81 PROJ. NO. 80-238-822

CHKD. BY DLG DATE 5-6-81 SHEET NO. 9 OF EE

Engineers • Geologists • Planners
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CONSULTANTS, INC.

0.30 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	965.	723.	256.	124.	37342.
CMS	27.	20.	7.	4.	1057.
INCHES		4.26	6.03	6.11	6.11
MM		108.11	153.23	155.12	155.12
AC-FT		358.	508.	514.	514.
THOUS CU M		442.	627.	634.	634.

0.50 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1826.	1263.	437.	213.	63750.
CMS	52.	36.	12.	6.	1805.
INCHES		7.44	10.29	10.43	10.43
MM		188.91	261.47	264.82	264.82
AC-FT		626.	867.	878.	878.
THOUS CU M		773.	1069.	1083.	1083.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3924.	2632.	896.	436.	130816.
CMS	111.	75.	25.	12.	3704.
INCHES		15.49	21.11	21.39	21.39
MM		393.55	536.13	543.41	543.41
AC-FT		1305.	1778.	1802.	1802.
THOUS CU M		1610.	2193.	2223.	2223.

********** *********** ********** ********* **********

HYDROGRAPH ROUTING

ROUTE TOTAL HYDROGRAPH THROUGH FAWN LAKE DAM.

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	FLD	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-997.	-1

STAGE	997.00	997.70	998.30	999.00	999.60	999.70	999.90	1000.10	1000.20
	1000.70	1001.00	1001.50	1002.00	1003.00				
FLOW	0.00	30.00	90.00	200.00	370.00	390.00	470.00	580.00	660.00
	1630.00	2610.00	4640.00	7210.00	13000.00				
SURFACE AREA=	0.	7.	11.	11.	20.				
CAPACITY=	0.	44.	68.	71.	377.				
ELEVATION=	978.	997.	1000.	1000.	1020.				

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
997.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
999.7	0.0	0.0	0.

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 5-6-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-6-81 SHEET NO. Q OF EE

GAI CONSULTANTS, INC.
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FAWN LAKE
DAM OUTFLOW
HYDROGRAPHS

0.10 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	213.	192.	15.	16.	1in.
CMS	6.	5.	2.	1.	309.
INCHES		1.13	1.77	1.78	1.78
MM		28.76	44.90	45.30	45.30
AC-FT		93.	149.	150.	150.
THOUS CU M		116.	184.	185.	185.

0.20 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	605.	446.	161.	78.	23606.
CMS	17.	13.	5.	2.	663.
INCHES		2.63	3.79	3.83	3.83
MM		66.73	96.33	97.23	97.23
AC-FT		221.	319.	322.	322.
THOUS CU M		273.	394.	398.	398.

0.30 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	964.	717.	249.	121.	36237.
CMS	27.	20.	7.	3.	1026.
INCHES		4.22	5.87	5.93	5.93
MM		107.17	149.10	150.53	150.53
AC-FT		355.	494.	499.	499.
THOUS CU M		438.	610.	616.	616.

0.50 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1827.	1261.	430.	208.	62530.
CMS	52.	36.	12.	6.	1771.
INCHES		7.42	10.13	10.23	10.23
MM		188.56	257.20	259.75	259.75
AC-FT		625.	851.	861.	861.
THOUS CU M		771.	1052.	1062.	1062.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3927.	2632.	889.	431.	129379.
CMS	111.	75.	25.	12.	3664.
INCHES		15.50	20.94	21.16	21.16
MM		393.66	531.80	537.44	537.44
AC-FT		1305.	1761.	1782.	1782.
THOUS CU M		1610.	2175.	2198.	2198.

AD-A101 245 GAI CONSULTANTS INC MONROEVILLE PA F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. FAWN LAKE DAM (NDI I.D. NUMBER--ETC(U)
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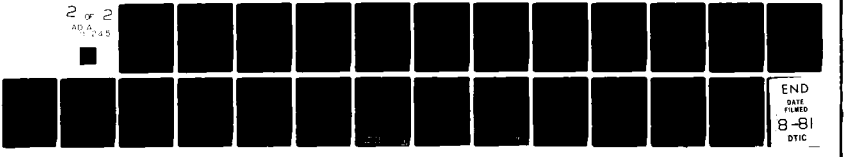
UNCLASSIFIED NL



SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DTS DATE 5-6-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-6-81 SHEET NO. 8 OF EE

gai CONSULTANTS, INC.
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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 .10	RATIO 2 .20	RATIOS APPLIED TO FLOWS RATIO 3 .30	RATIO 4 .50	RATIO 5 1.00
HYDROGRAPH AT	LRD	.10	1	43.	85.	128.	213.	427.
		(.26)	(	1.21)(	2.42)(	3.63)(	6.04)(	12.08)(
ROUTED TO	LWD	.10	1	17.	46.	75.	146.	375.
		(.26)	(	.48)(	1.32)(	2.14)(	4.13)(	10.61)(
HYDROGRAPH AT	RD	1.10	1	275.	551.	926.	1377.	2754.
		(2.85)	(	7.80)(	15.60)(	23.40)(	39.00)(	77.99)(
2 COMBINED	RD	1.20	1	291.	596.	901.	1523.	3072.
		(3.11)	(	8.24)(	16.87)(	25.52)(	43.12)(	86.99)(
ROUTED TO	RD	1.20	1	205.	482.	762.	1411.	2977.
		(3.11)	(	5.82)(	13.65)(	21.57)(	39.97)(	84.30)(
HYDROGRAPH AT	LRLD	.11	1	52.	103.	155.	258.	517.
		(.28)	(	1.46)(	2.93)(	4.39)(	7.31)(	14.63)(
2 COMBINED	LRLD	1.31	1	214.	513.	813.	1516.	3223.
		(3.39)	(	6.07)(	14.51)(	23.01)(	42.92)(	91.27)(
ROUTED TO	LRLD	1.31	1	196.	510.	811.	1513.	3221.
		(3.39)	(	5.56)(	14.46)(	22.96)(	42.85)(	91.21)(
HYDROGRAPH AT	LFLD	.17	1	60.	121.	181.	302.	604.
		(.44)	(	1.71)(	3.42)(	5.13)(	8.55)(	17.10)(
2 COMBINED	LFLD	1.48	1	208.	573.	908.	1712.	3666.
		(3.83)	(	5.88)(	16.22)(	25.72)(	48.46)(	103.82)(
ROUTED TO	LFLD	1.48	1	207.	572.	908.	1713.	3668.
		(3.83)	(	5.87)(	16.21)(	25.70)(	48.50)(	103.88)(
HYDROGRAPH AT	FLD	.10	1	37.	74.	111.	185	370.
		(.26)	(	1.05)(	2.09)(	3.14)(	5.23)(	10.46)(
2 COMBINED	FLD	1.58	1	217.	609.	965.	1826.	3924.
		(4.09)	(	6.15)(	17.23)(	27.32)(	51.71)(	111.13)(
ROUTED TO	FLD	1.58	1	213.	605.	964.	1827.	3927.
		(4.09)	(	6.04)(	17.13)(	27.30)(	51.73)(	111.19)(

SUBJECT DAM SAFETY INSPECTION

FAWN LAKE DAM

BY JJS DATE 5-6-81 PROJ. NO. 80-228-822

CHKD. BY DLB DATE 5-6-81 SHEET NO. 5 OF 55

GAI CONSULTANTS, INC.
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SUMMARY OF DAM SAFETY ANALYSIS

LONG RIDGE DAM; OVERTOPS @ = 0.60PMF

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1188.00	1188.00	1190.10
STORAGE	42.	42.	63.
OUTFLOW	0.	0.	190.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1188.59	0.00	47.	17.	0.00	42.00	0.00
.20	1189.01	0.00	51.	46.	0.00	41.17	0.00
.30	1189.35	0.00	55.	75.	0.00	41.00	0.00
.50	1189.84	0.00	60.	146.	0.00	40.83	0.00
1.00	1190.56	.46	68.	375.	2.50	40.33	0.00

RICKARDS DAM; OVERTOPS @ = 0.29 PMF

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1077.00	1077.00	1079.10
STORAGE	98.	98.	187.
OUTFLOW	0.	0.	720.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1077.93	0.00	138.	205.	0.00	42.83	0.00
.20	1078.68	0.00	165.	482.	0.00	42.33	0.00
.30	1079.14	.04	190.	762.	1.33	42.17	0.00
.50	1079.62	.52	219.	1411.	4.17	41.50	0.00
1.00	1080.25	1.15	260.	2977.	7.33	41.17	0.00

LOWER RICKARDS DAM; OVERTOPS @ = 0.10PMF

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1070.00	1070.00	1071.70
STORAGE	75.	75.	103.
OUTFLOW	0.	0.	209.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1071.63	0.00	101.	196.	0.00	43.83	0.00
.20	1071.99	.29	108.	510.	5.83	42.33	0.00
.30	1072.18	.48	111.	811.	7.83	42.17	0.00
.50	1072.52	.82	117.	1513.	10.33	41.50	0.00
1.00	1073.16	1.46	129.	3221.	13.17	41.17	0.00

SUBJECT DAM SAFETY INSPECTION

FAWN LAKE DAM

BY DJS DATE 5-6-81 PROJ. NO. 80-238-822

CHKD. BY DLG DATE 5-6-81 SHEET NO. 1 OF 2E

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LITTLE FAWN LAKE DAM; OVERTOPS @ = 0.06 PMF

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1010.00	1010.00	1012.40
STORAGE	6.	6.	13.
OUTFLOW	0.	0.	130.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1012.86	.46	15.	207.	7.00	43.33	0.00
.20	1013.49	1.09	17.	572.	10.50	42.17	0.00
.30	1013.78	1.38	18.	908.	12.00	42.00	0.00
.50	1014.28	1.88	20.	1713.	13.00	41.50	0.00
1.00	1015.18	2.78	24.	3668.	16.00	41.17	0.00

FAWN LAKE DAM; OVERTOPS @ = 0.15 PMF

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	997.00	997.00	999.70
STORAGE	44.	44.	66.
OUTFLOW	0.	0.	390.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	999.05	0.00	61.	213.	0.00	43.50	0.00
.20	1000.13	.83	73.	605.	3.83	42.33	0.00
.30	1000.41	.71	76.	964.	5.83	42.00	0.00
.50	1000.76	1.06	80.	1827.	8.17	41.50	0.00
1.00	1001.32	1.62	86.	3927.	11.50	41.17	0.00

DAM SAFETY INSPECTION
FAWN LAKE DAM *** BREACH ANALYSIS *** (U.S. DAMS INCLUDED)
10-MINUTE TIME STEP AND 48-HOUR STORM DURATION

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	10	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 6 NRTIO= 1 LRTIO= 1

RTIOS= .20

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE TOTAL HYDROGRAPH THROUGH FAWN LAKE DAM

DAM DATA

TOPEL	COOD	EXPD	DAMWID
999.7	0.0	0.0	0.

DAM BREACH DATA

BRWID	Z	ELBR	TFAIL	WSEL	FAILEL
0.	1.00	978.00	.50	997.00	999.70

STATION FLD . PLAN 1, RATIO 1

BEGIN DAM FAILURE AT 41.00 HOURS

PEAK OUTFLOW IS 3004. AT TIME 41.50 HOURS

DAM BREACH DATA

BRWID	Z	ELBR	TFAIL	WSEL	FAILEL
300.	10.00	978.00	.50	997.00	999.70

STATION FLD . PLAN 2, RATIO 1

BEGIN DAM FAILURE AT 41.00 HOURS

PEAK OUTFLOW IS 4327. AT TIME 41.12 HOURS

BREACHING ANALYSIS

(INPUT DATA IS SAME AS FOR OVERTOPPING ANALYSIS, WITH THE ADDITION OF THE BREACH CRITERIA GIVEN HERE)

(0.20 PMF EVENT)

PLAN

(1)

(2)

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM
BY BJS DATE 5-6-81 PROJ. NO. 80-228-822
CHKD. BY DLG DATE 5-6-81 SHEET NO. 4 OF 55

CONSULTANTS, INC.
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SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 5-6-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-6-81 SHEET NO. V OF EE

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PLAN

③

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
0.	1.00	978.00	4.00	997.00	999.70

STATION FLD , PLAN 3, RATIO 1

BEGIN DAM FAILURE AT 41.00 HOURS

PEAK OUTFLOW IS 893. AT TIME 43.50 HOURS

④

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
300.	10.00	978.00	4.00	997.00	999.70

STATION FLD , PLAN 4, RATIO 1

BEGIN DAM FAILURE AT 41.06 HOURS

PEAK OUTFLOW IS 1110. AT TIME 41.42 HOURS

⑤

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
60.	1.00	978.00	1.00	997.00	999.70

STATION FLD , PLAN 5, RATIO 1

BEGIN DAM FAILURE AT 41.00 HOURS

PEAK OUTFLOW IS 2203. AT TIME 41.42 HOURS

SUBJECT DAM SAFETY INSPECTION

FAWN LAKE DAM

BY ZJS DATE 5-6-81 PROJ. NO. 80-228-822

CHKD. BY DLB DATE 5-6-81 SHEET NO. 14 OF 55

GAI CONSULTANTS, INC.

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PLAN
(2)

THE DAM BREACH HYDROGRAPH WAS DEVELOPED USING A TIME INTERVAL OF .019 HOURS DURING BREACH FORMATION.
DOWNSTREAM CALCULATIONS WILL USE A TIME INTERVAL OF .167 HOURS.
THIS TABLE COMPARES THE HYDROGRAPH FOR DOWNSTREAM CALCULATIONS WITH THE COMPUTED BREACH HYDROGRAPH.
INTERMEDIATE FLOWS ARE INTERPOLATED FROM END-OF-PERIOD VALUES.

TIME (HOURS)	TIME FROM BEGINNING OF BREACH (HOURS)	INTERPOLATED BREACH HYDROGRAPH (CFS)	-	COMPUTED BREACH HYDROGRAPH (CFS)	=	ERROR (CFS)	ACCUMULATED ERROR (CFS)	ACCUMULATED ERROR (AC-FT)
41.000	0.000	403.		403.		0.	0.	0.
41.010	.010	608.		679.		-71.	-71.	-0.
41.020	.020	813.		1121.		-308.	-378.	-0.
41.029	.029	1018.		1634.		-616.	-994.	-1.
41.039	.039	1223.		2152.		-929.	-1923.	-2.
41.049	.049	1428.		2641.		-1213.	-3135.	-3.
41.059	.059	1633.		3078.		-1445.	-4580.	-4.
41.069	.069	1839.		3454.		-1616.	-6196.	-5.
41.078	.078	2044.		3778.		-1735.	-7931.	-6.
41.088	.088	2249.		4020.		-1772.	-9703.	-8.
41.098	.098	2454.		4193.		-1739.	-11442.	-9.
41.108	.108	2659.		4290.		-1631.	-13073.	-11.
41.118	.118	2864.		4327.		-1463.	-14536.	-12.
41.127	.127	3069.		4299.		-1230.	-15766.	-13.
41.137	.137	3274.		4237.		-963.	-16729.	-14.
41.147	.147	3479.		4144.		-665.	-17394.	-14.
41.157	.157	3684.		4026.		-342.	-17736.	-14.
41.167	.167	3889.		3889.		-0.	-17736.	-14.
41.176	.176	3744.		3738.		5.	-17731.	-14.
41.186	.186	3598.		3578.		20.	-17710.	-14.
41.196	.196	3453.		3412.		41.	-17669.	-14.
41.206	.206	3307.		3242.		65.	-17605.	-14.
41.216	.216	3161.		3073.		88.	-17516.	-14.
41.225	.225	3016.		2905.		111.	-17406.	-14.
41.235	.235	2870.		2740.		130.	-17276.	-14.
41.245	.245	2725.		2580.		145.	-17131.	-14.
41.255	.255	2579.		2425.		155.	-16976.	-14.
41.265	.265	2434.		2275.		158.	-16818.	-14.
41.275	.275	2288.		2132.		156.	-16662.	-14.
41.284	.284	2143.		1996.		147.	-16515.	-13.
41.294	.294	1997.		1866.		131.	-16383.	-13.
41.304	.304	1852.		1743.		109.	-16275.	-13.
41.314	.314	1706.		1627.		79.	-16195.	-13.
41.324	.324	1561.		1517.		43.	-16152.	-13.
41.333	.333	1415.		1415.		0.	-16152.	-13.
41.343	.343	1367.		1319.		47.	-16105.	-13.
41.353	.353	1318.		1230.		88.	-16016.	-13.
41.363	.363	1270.		1147.		123.	-15893.	-13.
41.373	.373	1221.		1070.		151.	-15742.	-13.
41.382	.382	1173.		1000.		173.	-15570.	-13.
41.392	.392	1124.		936.		188.	-15381.	-12.
41.402	.402	1076.		878.		198.	-15184.	-12.
41.412	.412	1027.		826.		202.	-14982.	-12.
41.422	.422	979.		779.		199.	-14783.	-12.
41.431	.431	930.		738.		192.	-14591.	-12.
41.441	.441	882.		703.		179.	-14412.	-12.
41.451	.451	833.		673.		161.	-14251.	-12.
41.461	.461	785.		647.		138.	-14113.	-11.
41.471	.471	736.		627.		110.	-14004.	-11.
41.480	.480	688.		610.		78.	-13926.	-11.
41.490	.490	639.		599.		41.	-13885.	-11.
41.500	.500	591.		591.		0.	-13885.	-11.

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 5-6-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-6-81 SHEET NO. X OF EE

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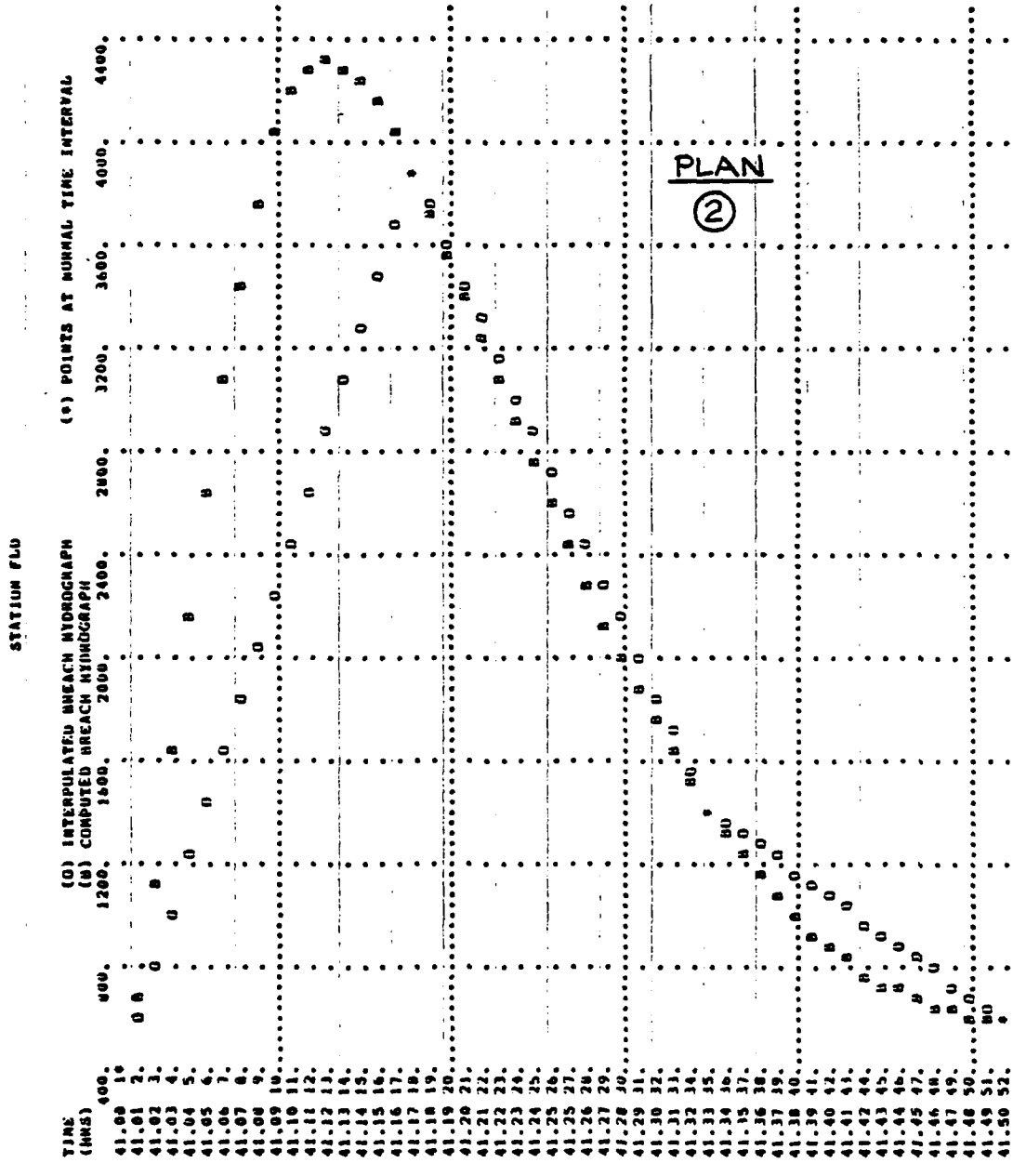

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM
BY JJS DATE 5-6-81 PROJ. NO. 80-238-822
CHKD. BY DLB DATE 5-6-81 SHEET NO. 7 OF EE

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THE DAM BREACH HYDROGRAPH WAS DEVELOPED USING A TIME INTERVAL OF .021 HOURS DURING BREACH FORMATION.
DOWNSTREAM CALCULATIONS WILL USE A TIME INTERVAL OF .167 HOURS.
THIS TABLE COMPARES THE HYDROGRAPH FOR DOWNSTREAM CALCULATIONS WITH THE COMPUTED BREACH HYDROGRAPH.
INTERMEDIATE FLOWS ARE INTERPOLATED FROM END-OF-PERIOD VALUES.

PLAN (5)

TIME (HOURS)	TIME FROM BEGINNING OF BREACH (HOURS)	INTERPOLATED BREACH HYDROGRAPH (CFS)	- COMPUTED BREACH HYDROGRAPH (CFS)	= ERROR (CFS)	ACCUMULATED ERROR (CFS)	ACCUMULATED ERROR (AC-FT)
41.000	0.000	401.	401.	0.	0.	0.
41.021	.021	524.	469.	55.	55.	0.
41.042	.042	648.	576.	72.	127.	0.
41.063	.063	771.	701.	70.	197.	0.
41.083	.083	895.	839.	56.	253.	0.
41.104	.104	1018.	985.	33.	286.	0.
41.125	.125	1142.	1127.	15.	301.	1.
41.146	.146	1265.	1262.	4.	305.	1.
41.167	.167	1389.	1389.	0.	305.	1.
41.188	.188	1479.	1506.	-26.	278.	0.
41.208	.208	1570.	1616.	-46.	233.	0.
41.229	.229	1661.	1730.	-70.	163.	0.
41.250	.250	1752.	1830.	-78.	85.	0.
41.271	.271	1842.	1914.	-72.	13.	0.
41.292	.292	1933.	1994.	-61.	-48.	-0.
41.313	.313	2024.	2057.	-33.	-80.	-0.
41.333	.333	2115.	2115.	0.	-80.	-0.
41.354	.354	2109.	2153.	-44.	-124.	-0.
41.375	.375	2103.	2186.	-83.	-208.	-0.
41.396	.396	2097.	2201.	-105.	-313.	-1.
41.417	.417	2092.	2203.	-112.	-425.	-1.
41.438	.437	2086.	2189.	-103.	-528.	-1.
41.458	.458	2080.	2161.	-81.	-609.	-1.
41.479	.479	2074.	2120.	-46.	-655.	-1.
41.500	.500	2068.	2068.	0.	-655.	-1.
41.521	.521	1988.	2007.	-19.	-674.	-1.
41.542	.542	1907.	1936.	-30.	-704.	-1.
41.563	.562	1826.	1859.	-33.	-737.	-1.
41.583	.583	1745.	1776.	-32.	-769.	-1.
41.604	.604	1664.	1690.	-26.	-795.	-1.
41.625	.625	1583.	1601.	-18.	-812.	-1.
41.646	.646	1502.	1511.	-9.	-821.	-1.
41.667	.667	1421.	1421.	0.	-821.	-1.
41.688	.687	1350.	1334.	16.	-805.	-1.
41.708	.708	1279.	1249.	30.	-775.	-1.
41.729	.729	1207.	1168.	39.	-735.	-1.
41.750	.750	1136.	1092.	44.	-691.	-1.
41.771	.771	1065.	1022.	43.	-649.	-1.
41.792	.792	993.	958.	35.	-614.	-1.
41.813	.812	922.	901.	21.	-593.	-1.
41.833	.833	851.	851.	0.	-593.	-1.
41.854	.854	824.	806.	17.	-576.	-1.
41.875	.875	797.	768.	29.	-547.	-1.
41.896	.896	770.	735.	35.	-513.	-1.
41.917	.917	743.	707.	36.	-477.	-1.
41.938	.937	716.	683.	32.	-444.	-1.
41.958	.958	688.	663.	25.	-419.	-1.
41.979	.979	661.	647.	14.	-405.	-1.
42.000	1.000	634.	634.	0.	-405.	-1.

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DJS DATE 5-6-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-6-81 SHEET NO. 2 OF EE

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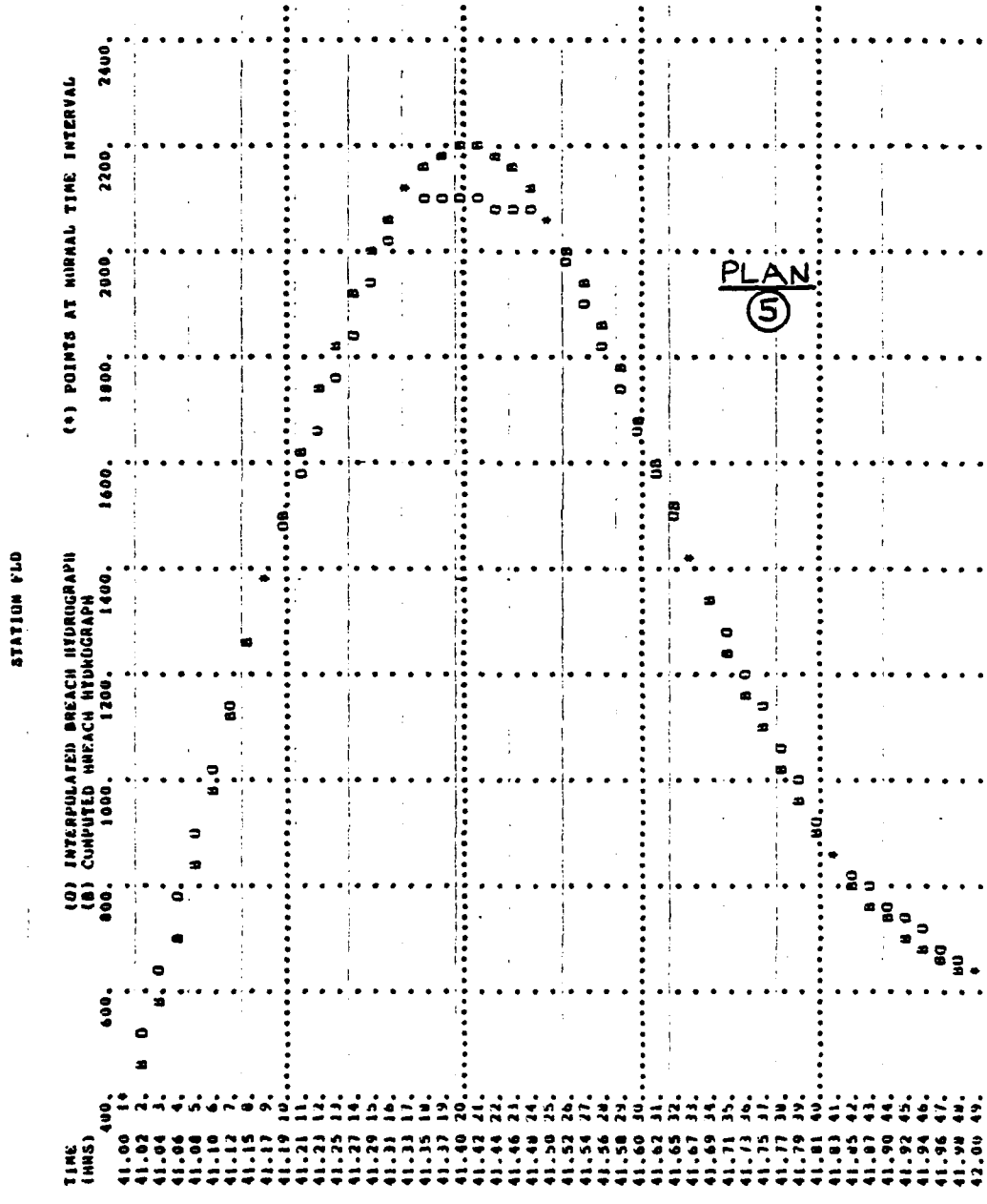

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM
BY JJS DATE 5-6-81 PROJ. NO. 80-228-822
CHKD. BY DLB DATE 5-6-81 SHEET NO. 44 OF EE

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HYDROGRAPH ROUTING

ROUTE FROM FAWN LAKE DAM TO SECTION 1: 2160 FT D.S. FROM DAM

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPNT	INAME	ISTAGE	IAUTO
SEC1	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPNP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELMV1	ELMAX	NLMTH	SEL
.0800	.0400	.0800	950.0	980.0	2160.	.01000

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

0.00	980.00	250.00	960.00	387.00	953.00	390.00	950.00	405.00	950.00
408.00	953.00	500.00	960.00	600.00	980.00				

STORAGE	0.00	1.30	2.86	6.93	15.05	27.21	43.41	63.24	85.34
	136.02	164.61	195.36	228.28	263.36	300.60	340.00	381.57	425.30
OUTFLOW	0.00	118.80	387.15	911.74	1862.21	3394.57	5641.06	8864.56	13002.73
	23874.49	30670.95	38420.67	47159.66	56924.33	67751.13	79676.44	92736.39	106966.86
STAGE	950.00	951.58	953.16	954.74	956.32	957.89	959.47	961.05	962.63
	965.79	967.37	968.95	970.53	972.11	973.68	975.26	976.84	978.42
FLOW	0.00	118.80	387.15	911.74	1862.21	3394.57	5641.06	8864.56	13002.73
	23874.49	30670.95	38420.67	47159.66	56924.33	67751.13	79676.44	92736.39	106966.86

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE FROM SECTION 1 TO SECTION 2: 6160 FT D.S. FROM DAM

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPNT	INAME	ISTAGE	IAUTO
SEC2	1	0	0	0	0	1	0	0

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPNP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

SUBJECT DAM SAFETY INSPECTION

FAWN LAKE DAM

BY DSS DATE 5-6-81 PROJ. NO. 80-238-822

CHKD. BY DAB DATE 5-6-81 SHEET NO. 33 OF 55

GAI CONSULTANTS, INC.

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NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0800	.0400	.0800	893.0	920.0	4000.	.01300

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

0.00 920.00 100.00 900.00 170.00 900.00 170.00 893.00 200.00 893.00
200.00 900.00 450.00 900.00 680.00 920.00

STORAGE	0.00	3.91	7.83	11.74	15.66	22.68	70.10	120.59	174.14
	290.41	353.14	418.93	487.77	559.68	634.65	712.67	793.76	877.90
OUTFLOW	0.00	215.46	647.22	1208.78	1861.96	2607.94	4905.94	8771.60	13942.71
	27886.26	36599.83	46464.29	57483.45	69666.51	83026.37	97578.55	113340.49	130331.01
STAGE	893.00	894.42	895.84	897.26	898.68	900.11	901.53	902.95	904.37
	907.21	908.63	910.05	911.47	912.89	914.32	915.74	917.16	918.58
FLOW	0.00	215.46	647.22	1208.78	1861.96	2607.94	4905.94	8771.60	13942.71
	27886.26	36599.83	46464.29	57483.45	69666.51	83026.37	97578.55	113340.49	130331.01

****

SUMMARY OF DAM SAFETY ANALYSIS

LONG RIDGE DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1188.00	1188.00	1190.10
STORAGE	42.	42.	63.
OUTFLOW	0.	0.	190.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	1189.01	0.00	51.	46.	0.00	41.17	0.00

RICKARDS DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1077.00	1077.00	1079.10
STORAGE	98.	98.	187.
OUTFLOW	0.	0.	720.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	1078.60	0.00	166.	492.	0.00	42.33	0.00

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM
BY BJS DATE 5-6-81 PROJ. NO. 80-228-822
CHKD. BY JLA DATE 5-6-81 SHEET NO. 22 OF 66

LOWER RICKARDS DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1070.00	1070.00	1071.70
STORAGE	75.	75.	103.
OUTFLOW	0.	0.	209.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	1071.99	.29	109.	510.	5.83	42.33	0.00

LITTLE FAWN LAKE DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1010.00	1010.00	1012.40
STORAGE	6.	6.	13.
OUTFLOW	0.	0.	130.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	1013.49	1.09	17.	572.	10.50	42.17	0.00

FAWN LAKE DAM

SUMMARY OF DAM SAFETY ANALYSIS

PLAN (1).....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	997.00	997.00	999.70
STORAGE	44.	44.	68.
OUTFLOW	0.	0.	390.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	999.79	.09	69.	3004.	.35	41.50	41.00

PLAN (2).....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	997.00	997.00	999.70
STORAGE	44.	44.	68.
OUTFLOW	0.	0.	390.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	999.72	.02	68.	4327.	.18	41.12	41.00

PLAN (3).....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	997.00	997.00	999.70
STORAGE	44.	44.	68.
OUTFLOW	0.	0.	390.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	1000.01	.31	71.	893.	1.42	43.58	41.00

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SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM
BY JSJ DATE 5-6-81 PROJ. NO. 80-238-822
CHKD. BY DLB DATE 5-6-81 SHEET NO. 22 OF 55

SECTION 1

PLAN (4).....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	997.00	997.00	999.70
STORAGE	44.	44.	68.
OUTFLOW	0.	0.	390.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	999.72	.02	68.	1110.	.25	41.42	41.00

PLAN (5).....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	997.00	997.00	999.70
STORAGE	44.	44.	68.
OUTFLOW	0.	0.	390.

RATIO OF PMF	MAXIMUM RESERVOIR W.S. ELEV.	MAXIMUM OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.20	999.74	.04	68.	2203.	.23	41.42	41.00

PLAN (6).....
(NON-BREACH)

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	997.00	997.00	999.70
STORAGE	44.	44.	68.
OUTFLOW	0.	0.	390.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	1000.13	.43	73.	605.	3.83	42.33	0.00

PLAN (1) STATION SEC1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	2303.	956.8	41.50

PLAN (2) STATION SEC1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	2605.	957.1	41.33

PLAN (3) STATION SEC1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	889.	954.7	43.67

PLAN (4) STATION SEC1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	1089.	955.0	41.67

PLAN (5) STATION SEC1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	2053.	956.5	41.50

PLAN (6) (NON-BREACH) STATION SEC1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	604.	953.8	42.33

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Engineers • Geologists • Planners
Environmental Specialists

SUBJECT DAM SAFETY INSPECTION
FAWN LAKE DAM

BY DTS DATE 5-6-81 PROJ. NO. 80-238-822

CHKD. BY DLB DATE 5-6-81 SHEET NO. EE OF EE

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SECTION 2

PLAN (1) STATION SEC2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	2173.	899.3	41.67

PLAN (2) STATION SEC2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	2265.	899.5	41.33

PLAN (3) STATION SEC2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	886.	896.4	43.83

PLAN (4) STATION SEC2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	1088.	897.0	41.67

PLAN (5) STATION SEC2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	1908.	898.8	41.67

PLAN (6) STATION SEC2
(NON-BREACH)

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	603.	895.7	42.50

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APPENDIX E

FIGURES

LIST OF FIGURES

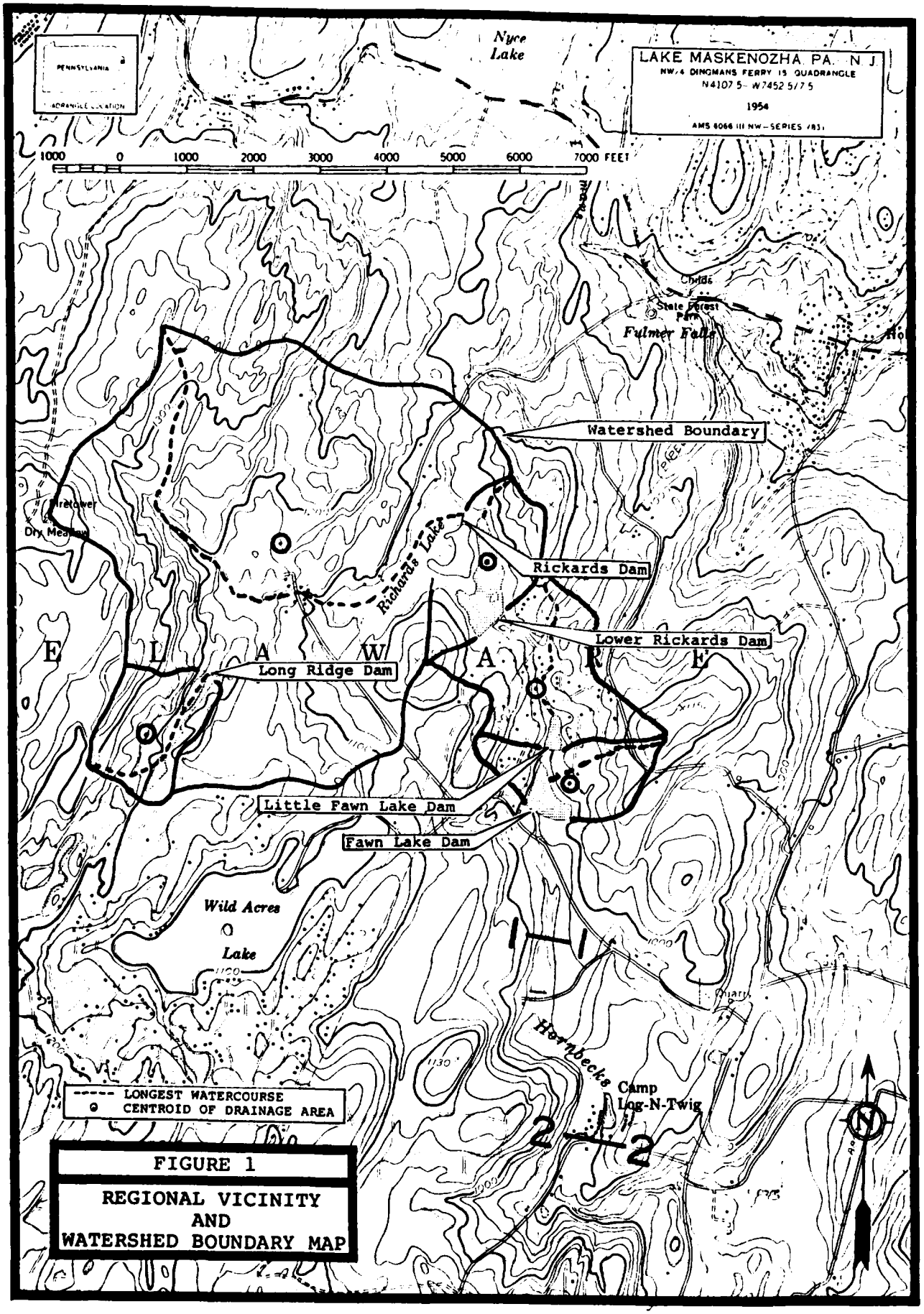
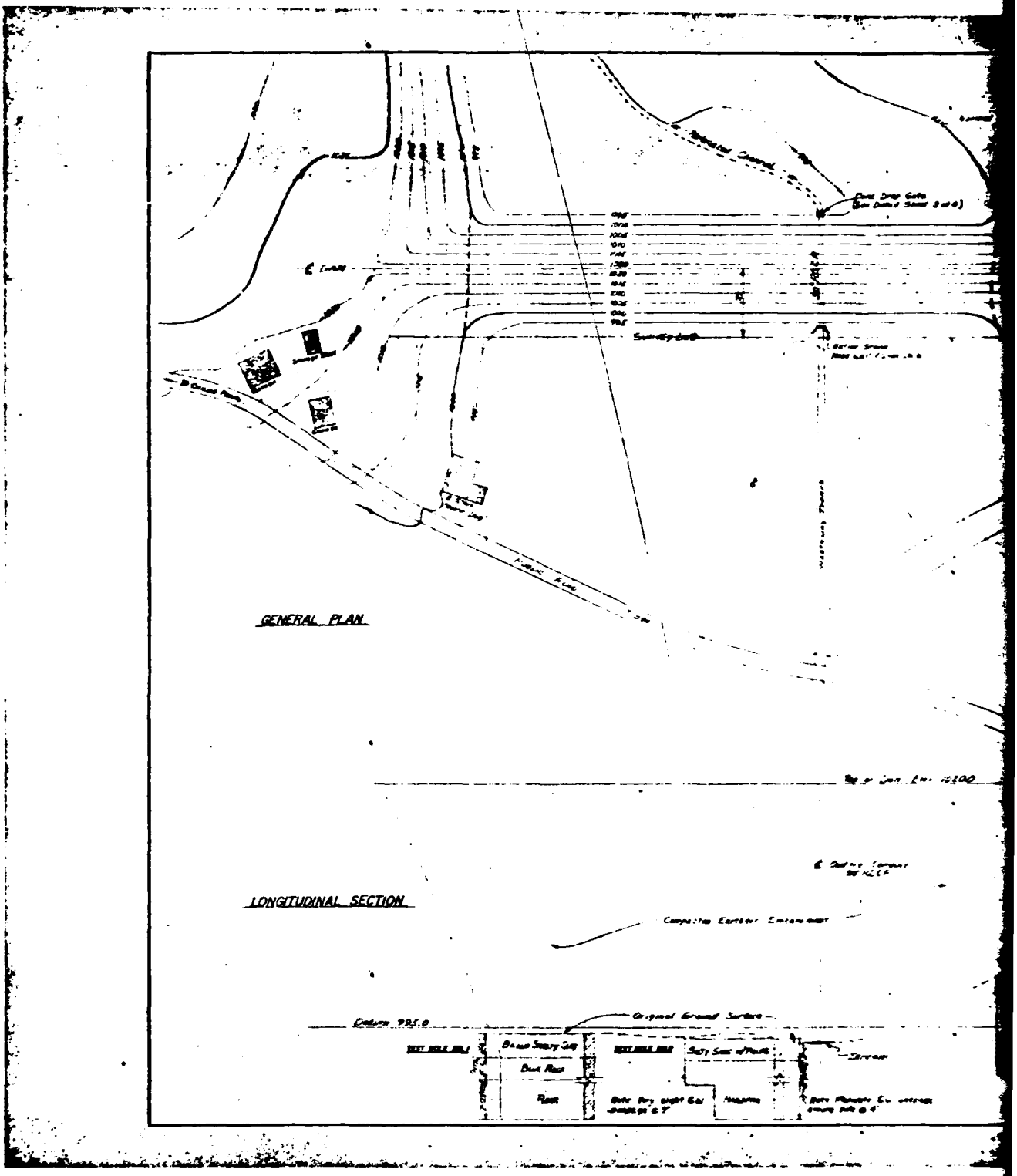


FIGURE 1

REGIONAL VICINITY AND WATERSHED BOUNDARY MAP


GENERAL PLAN
LONGITUDINAL SECTION
Original Ground Surface
Datum 995.0
Stream

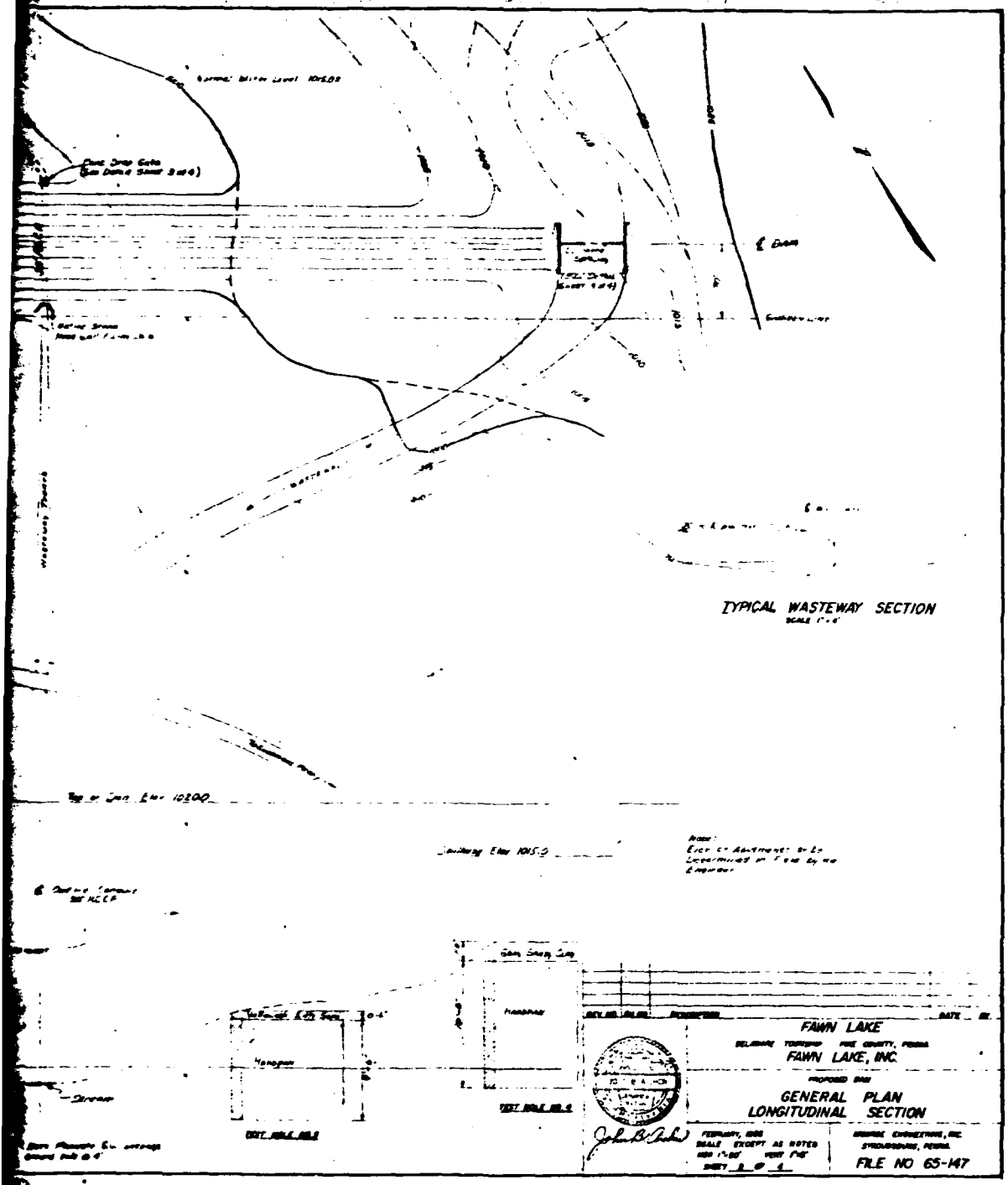


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FIGURE 2

r 2

APPENDIX F

GEOLOGY

Geology

Fawn Lake is located in the glaciated Low Plateaus section of the Appalachian Plateaus physiographic province of eastern Pennsylvania. In this area, the Appalachian Plateaus province is characterized topographically by flat-topped, hummocky hills formed as a result of glaciation and subsequent stream dissection of nearly flat-lying strata. The Devonian age sedimentary rock strata in Pike County regionally strike N35°E and dip gently to the northwest. The Delaware River is the major drainage basin in the area. Major tributary streams intersect the Delaware River at right angles; whereas, smaller streams display a slightly more random tributary pattern. Both major and minor tributary stream systems are joint controlled and exhibit modified rectangular and trellis-type drainage patterns.

Structurally, the area containing Pike County lies on the south flank of a broad, asymmetrical synclinorium that plunges to the southwest. Superimposed on this broad structural basin are numerous anticlinal and synclinal folds characterized by planar limbs and narrow hinges. Due to prior glaciation, low relief and surficial soil cover, fold axes are difficult to trace.

The sedimentary rock sequences in the vicinity of the dam and reservoir are probably members of the Susquehanna Group of Upper Devonian age (see Geology Map). The sedimentological changes observed in the Catskill Formation indicate that the rate of sedimentation exceeded the rate of basin subsidence, resulting in a facies change from marine to non-marine strata. On the accompanying geology map the delineation between the Middle and Upper Devonian age sedimentary rock sequences represents the Allegheny Front, which separates the Valley and Ridge physiographic province from the Appalachian Plateaus physiographic province.

Approximately half of Pike County, including the dam site, is covered by a blanket of Wisconsin age (most recent) glacial drift which, based on the degree of weathering, was probably deposited during the Woodfordian stage. Valley bottoms are typically covered by recent alluvium and Woodfordian outwash of variable thickness, but typically less than 10 feet. These deposits are characteristically unconsolidated stratified sand and gravel usually with more gravel than sand and some small boulders. The direction of the Wisconsin ice advance was from the northeast over the Catskill Mountains and from the north over the Appalachian Plateau. The terminal moraine resulting from the southern most advance of the Wisconsin ice sheet in this area is located in the southern portion of Monroe County, which borders Pike County to the South.

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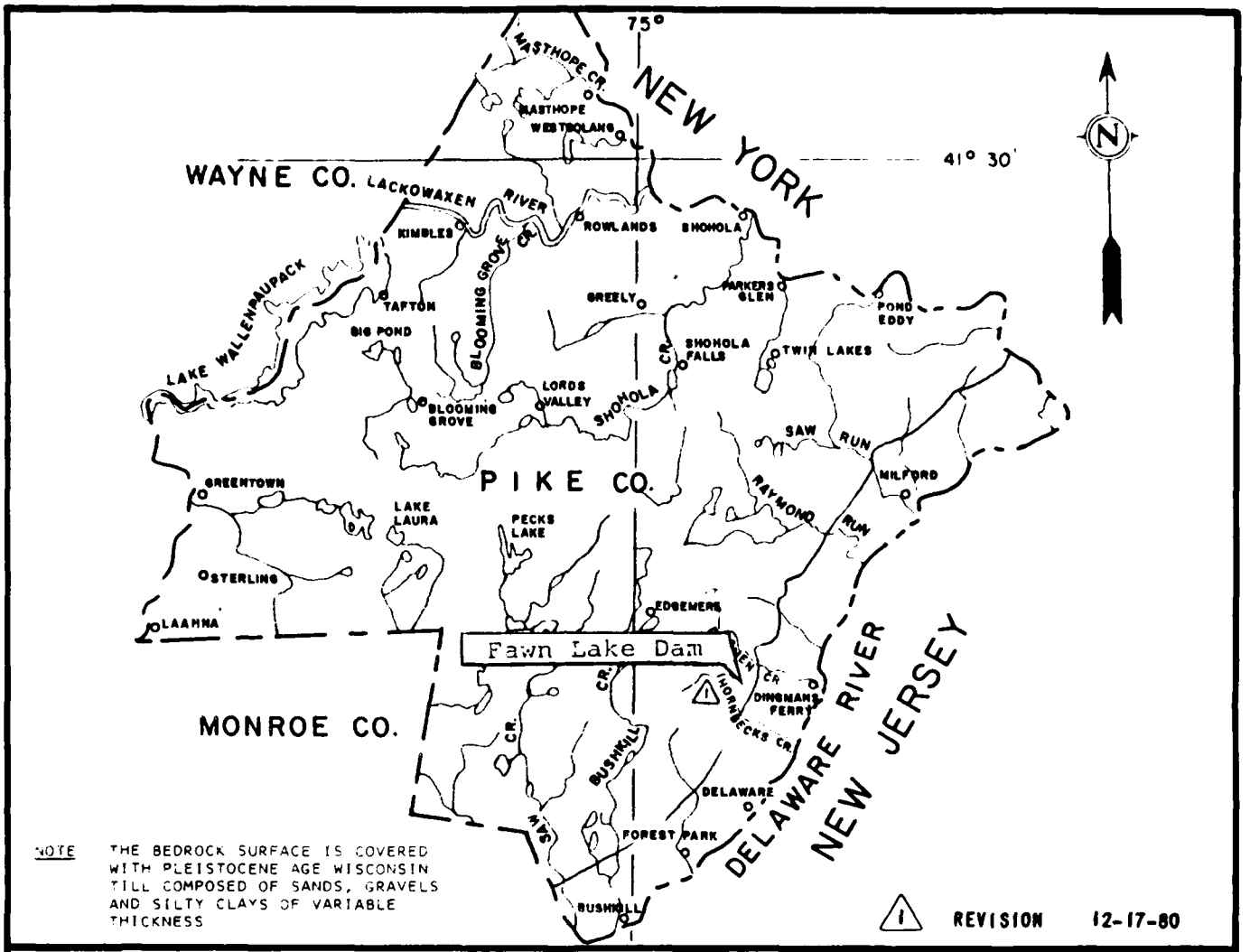

NOTE THE BEDROCK SURFACE IS COVERED WITH PLEISTOCENE AGE WISCONSIN TILL COMPOSED OF SANDS, GRAVELS AND SILTY CLAYS OF VARIABLE THICKNESS

LEGEND

UPPER DEVONIAN

SUSQUEHANNA GROUP

Catskill Formation - *Shohola Member interbedded 5- to 25-foot thick units of greenish-gray, red-mottled very fine- to medium-grained sandstone and sandy shale and brown to olive-gray to medium-red-gray sandstone and shale. Sandstones are predominantly low-rank graywackes. Beds are thin to massive thick and most have simple or planar sets of small- to medium-scale, generally low-angle cross-stratification. Contacts with shale units are abruptly disconformable to gradational. Joint sets are poorly developed. Shale is thinly laminated and well cleaved. Mud cracks, convolute bedding, and salt marks are present in some contacts with sandstone units. Member is more than 2,000 feet thick. Lower contact is gradational and is placed at top of highest red bed of the underlying Analomink. Analomink has Chair Member, medium-gray-green silty, micaceous, finely laminated well-cleaved shale containing thin beds of brownish-gray sandy siltstone and silty very fine grained sandstone. Unit is the "first red" at or up section in Upper Devonian rocks. Member is about 100 feet thick. Lower contact is gradational and is placed at the base of lowest red bed. Delaware River Flags Member, grayish-green, micaceous, laminated sandstone and brown-weathering sandy shale. Beds range from a few inches to as much as 4 feet thick. Sandstones are low-rank graywackes and contain no marine fossils. Member is about 300 feet thick. Lower contact is arbitrarily placed.*

MIDDLE DEVONIAN

HAMILTON GROUP

Mahantango Formation - *Upper member medium-dark-gray, fairly coarse grained, thin-bedded siltstone and silty shale; member is about 700 feet thick and is separated from lower member by the "Centerfield Reef," a calcareous siltstone limestone containing abundant horn corals. The Centerfield is about 75 feet thick. Lower member, virtually same lithology as upper member. Unit is about 1,100 feet thick. Lower contact is gradational.*

Marcellus Shale - *Dark-gray, evenly laminated, silty clay shale and clayey silt shale. Unit commonly contains very hard limy concretions and is well cleaved; bedding is generally obscured. Member is about 75-foot thick. Lower contact is gradational.*

SCALE

0 6 12 18 MILES

REFERENCE:
GEOLOGIC MAP OF NORTHEASTERN PENNSYLVANIA. COMPILED BY GEO. W. STOSE AND O.A. LJUNGSTEDT COMMONWEALTH OF PENNSYLVANIA DEPT. OF INTERNAL AFFAIRS DATED 1932, SCALE 1" = 6 MILES.

GEOLOGY MAP

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